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ENTOMOLOGY FOR BEGINNERS.

THE RASPBERRY SAW-FLY.

Selandria rubi Harris.

BY THE EDITOR.

This destructive insect appeared in great force during the past season in many parts of our Province, doing much damage to the foliage of raspberry plants. Although in form and habits the larva of this insect much resembles the currant worm, it is not nearly so well known, nor is it usually so promptly recognized. There are several reasons for this. The raspberry saw-fly does not appear in such flocks as the currant worm, because the eggs are laid singly and not often near together; nor is the larva easily detected owing to the fact that in color it so exactly resembles that of the leaf on which it feeds.

The eggs are oval, yellowish white and semi-transparent, and are buried beneath the skin of the raspberry leaf near the ribs and veins, placed there by means of the saw-like apparatus situated at the extremity of the body of the female, by which slits are cut in the tissues of the leaf. The skin covering the egg is so transparent that the movements of the enclosed larva may be observed several days before it is hatched. It escapes through an irregular hole made on one side of the egg.

The newly-hatched larva is about one-twelfth of an inch long, with a greenish-white head having a black eye-like spot on each side. The body is nearly white, semi-transparent and thickly covered with transverse rows of white spines. As it grows older the color changes to green, and when full grown it measures about three-quarters of an inch in length and appears as shown on the leaf in figure 1. The body then is of a dark green color, and is thickly set with pale green branching spines. In figure 1 some of the segments of the body are represented, magnified, showing the arrangement of the spines on the back and side. The head is small, of a pale yellowish green color, with a dark brown dot on each

side. The eggs are laid near the tips of the growing canes, and the larvæ are usually found feeding on the upper surface of the young leaves. When full grown, which is generally from the middle to the end of June, the larva leaves the bush and descends to the ground, where it penetrates beneath the surface and constructs a small oval earthy cocoon mixed with silky and glutinous material. The larva remains unchanged within the cocoon for a considerable period, but finally transforms to a chrysalis from which the perfect insect is produced the following season.

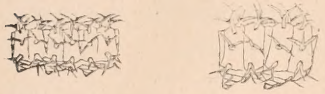

Fig. 1.

This is a four-winged fly, shown magnified in figure 2, which appears from about the tenth of May to the beginning of June, or soon after the young leaves of the raspberry begin to appear. The wings, which are transparent with a glossy surface and metallic hue, measure when expanded about half an inch across; the veins are black and there is a streak of black along the front margin, extending more than half way towards the tip of the wing. The anterior part of the body is black, the abdomen of a dark reddish hue. Early in the morning when the air is cool these flies, when approached, will fall from the bushes to the ground and remain inactive there long enough to admit of many of them being caught and destroyed, but as the heat of the day increases they become much quicker in their movements, and when disturbed take wing readily.

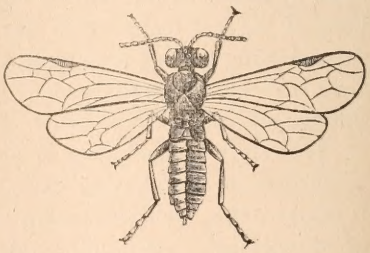

Fig. 2.

The larvæ may be promptly destroyed by syringing the bushes with water in which powdered hellebore has been mixed in the proportion of an ounce of the powder to a pailful of water, or with Paris green and water in the proportion of a teaspoonful of the poison to a pailful of water.

SPECIES, VARIETIES AND RACES.*

BY JOHN B. SMITH, BROOKLYN, N. Y.

At the recent meeting of the Entomological Club of the A. A. A. S., Dr. Horn found occasion to say that "nature has no genera, but species only"—genera are mere artificial aids to classification, are seldom sharply defined, and are of very unequal value, according as the student is inclined to value characters; nor are the same characters useful in all the orders, nor indeed in the several families in the same order.

The important part of Dr. Horn's remarks, for the present purpose, is the assertion that "nature has no genera." That Dr. Horn has an experience in American Coleoptera large enough to render such an observation from him of great weight, no one will dispute, and taking the Lepidoptera into consideration I am led by my studies to agree with him thoroughly.

Afterward, at the same meeting, Prof. Fernald, than whom we have no better authority on Micro-lepidoptera, stated that he was greatly interested in Dr. Horn's view of genera, but for his part he would be well content to have a satisfactory limit to species.

What is a species? The question has oft been asked, and never satisfactorily answered. Dr. LeConte long since stated in reply to that question, "Alas! we do not know." Elsewhere he defines it as "an assemblage of individuals which differ from each other by very small or trifling and inconstant characters, of much less value than those in which they differ from other assemblages of individuals; but who determines the value of these characters? The experienced student of that department to which the object belongs; therefore groups of individuals which are recognized as such by those who from natural power and education are best qualified to judge."

This, therefore, does not quite answer the question, but leaves an element of opinion in the matter.

Not long since, Mr. W. H. Edwards, in an article on the species of *Papilio*, says: "I hold that every permanent form possessed of marked characters which distinguish it from other forms, and which breeds true to its type, so far as appears or we can know, is to be regarded as a species,

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Read before the Brooklyn Entomological Society, Nov. 29, 1884.

at least till the contrary is proved. And the proof must be actual, not imaginary, facts, not guess work."

Mr. Edwards' definition is very good, but it leaves open the question, What is a "marked character"? That this is a question of opinion will hardly be disputed, and we are thus left as far as ever from a definite reply to our question. I shall not attempt to offer any new definition of a species; but shall in the present essay confine myself to a few instances tending to show that the breeding true to itself is no test of a species, and further that characters to separate species must be sought in other points than color and maculation.

In the Coleoptera no family offers better examples than the Cicindelidæ, and from this family my instances shall be drawn.

The variations of *Cic. 6-guttata* have been recently noted in the CANADIAN ENTOMOLOGIST. My own series of the species consists of 31 specimens, ranging from the immaculate form, blue and green in color, to the *patruele* form with complete median fascia, humeral and sub-humeral spots. The variation in this species is very wide, and is found everywhere, except that the *patruele* form is not found eastward.

A more interesting species is *scutellaris*, of which my series comprises 35 specimens.

In the far west—Kansas, Ind. Terr. and thereabouts—we find the type form of a beautiful metallic red bronze, the scutellar space green, maculation indistinct. It is the only form found in the far west, and is perfectly separable from the following.

In the Eastern States (N. Y., R. I., Md. and Mass., according to my collection) we find a form with similar markings, which are, however, much more distinct, but the ground color is a sordid green. This form is also perfectly distinct from any other, and is recognizable at a glance. With similar markings we find an insect locally in N. J. and Pa., which, however, has the ground color black. It is taken year after year in a small spot near Jersey City, and never shows any approach to the preceding or following. It breeds absolutely true to itself; none of the other forms are taken where it flies. In Northern N. Y., Mass. and Can. we find the same form as to markings, but the ground color brown red with the maculation often connected at margin.

In the Southern States we find the same form green or blue without markings, and in Georgia and perhaps in Va. we find an insect obviously the same, but entirely black. We have therefore a range of color variation

from dead black to bright brown red, to bright green and to metallic bronze red. In maculation from no markings at all to a pale margin to elytra, apical and humeral lunule and marginal spots. The interesting point in these variations is that they are local, that they breed absolutely true to themselves, that they are permanent, possessed of marked characteristics, and are yet merely *races* of one species. Of *Cic. purpurea* I have a series of 46 specimens varying from immaculate bronze red to bright bluish *green;* in maculation from an indistinct median streak to a broad deflexed band, broad apical and humeral lunules, and pale outer margin connecting all markings. The variation is wonderful, and it is not so only in color and maculation, but also in size, and to a less extent in form, *decem-notata* being much more slender than the normal form. These, while much less sharply distinct than in the forms of *scutellaris*, are yet largely local, and the local forms in many of the instances breed absolutely true to themselves. The difference between my specimen from Nevada, which is very large and entirely green, and the common Eastern form, is immense, and as great as there is between any two species of the genus.

C. formosa is in the West bright metallic red, while in the East it is obscure slate gray, though often with an obvious reddish sheen. These forms breed absolutely true to themselves, and are possessed of marked characters separating them. Yet they are certainly the same. These examples in the Cicindelidæ are not isolated, and indeed it may be said that most of the more widely distributed forms show analogous variations; the variations being important from my point of view by the fact that they are permanent, distinctive, and local.

Thus far as to variations in color. In sculpture there is also a difference, less local, however, the elytra being foveate or not in one and the same form *(abdominalis)*, and sometimes almost smooth and distinctly punctured *(Pilatei)*.

In sculpture the Carabidæ show more variation, and while my own collection does not show it, Mr. Ulke called my attention to his series, showing an astonishing range of variation in the sculpture of elytra of the same form, and these variations were all more or less local.

Other structural characters vary, and often locally, but need not be especially noted here, the variation in number of the antennal joints in *Prionus* being cited as curious rather than important to our present purpose.

What I have endeavored to show here is a great variability in color and maculation; local constancy of color and maculation, and that the local forms often breed absolutely true to themselves, and come fully within Mr. Edwards' definition of a species.

In the Lepidoptera we find variations equally great The species of *Satyrus* may serve as an example. Taking the two forms named, *nephele* and *alope* alone, and excluding *pegala*, which really in my opinion belongs with them, we have here two forms, to each of which in most localities Mr. Edwards' definition of a species will perfectly apply.

In my paper on the genus *Satyrus* I have recorded the variations of the species, local and otherwise, and my conclusion on a re-examination of further material is confirmed, showing that in the genus *Satyrus* maculation, so far as any exists, is absolutely valueless for specific separation; and further, though it is possible, of course, to separate the forms, I believe there is no distinct line of demarcation between most of the "species" even recognized in that paper.

In *Chionobas* and *Cœnonympha* we have analogous variation, also largely local; but the material in these genera is not yet sufficiently large to allow a final conclusion. In the Noctuidæ very similar variations occur. In the East, *Agrotis lubricans* is one of our most constant forms and has a handsome reddish suffusion over the primaries. In Kans. and N. M is found a form apparently bearing no relation to it; but yet when closely examined proving identical with our Eastern forms, except that the red shade is replaced by blackish. This Western form Mr. Grote named *beata*. In Texas the examples taken are intermediate between the extremes of Eastern and Western types, and as properly referred to one as the other.

The variations of *Agrotis declarata* Wlk. (*campestris* Grt., *decolor* Morr., and *verticalis* Gu.) further illustrate the same local tendencies. This, in the East, is dark in ground color; westerly the thorax and basal space become rust red, and in some localities the only form found has a lilac gray ground color. Now it is scarcely conceivable that with the same amount of material to work with, any one could come to a different conclusion, yet at least two of the forms are good species under Mr. Edwards' definition. Other species show equally striking variations, and yet are undoubtedly alike.

I have cited but a few instances of variation, where the variations are

to an extent constant and local; many more could be cited, but these are sufficient to show—

First, that ground color cannot be exclusively relied upon as specific distinction, either in Coleoptera or Lepidoptera.

Second, that maculation, except where it completely changes a pattern, is not in itself a specific character.

Third, that species which are widely distributed vary, and the variations are often local, and constant.

In reference to this last proposition, it is a recognized fact that in Coleoptera the most common and widely distributed species show the greatest variations. *Pterostichus lucublandus* may be cited as an instance. That the Atlantic coast fauna is very widely distributed, many species ranging from Maine to Texas, and westward beyond the Mississippi. That further west the faunal character changes. The Heteromerous type becomes most prominent; often apterous and usually slow in motion, and living in crevices, the species do not travel much, and well marked forms are often locally common, but not elsewhere found. In the great canons and valleys of the Rocky Mts. and the Sierras, nearly each has its own peculiar fauna, poor in species, but rich in examples, and owing to the natural barriers to the habits of the predominant types, species become fixed, local, and very constant, showing little or no variation.

To the Lepidoptera these natural obstacles do not form as complete a barrier, because of their powers of flight; still we find a tendency to local variation. The *Agrotes* afford good examples of that.

Now in an admitted case like the variation of *Cic. scutellaris* and *Satyrus nephele*, by what term shall we designate these forms? Not as species, for they differ only in characters which are inconstant, yet the characters are locally permanent. Sub-species conveys an indefinite and inaccurate idea; variety is applied also to forms which occur mingled with the type form, and not exclusively applicable to such local forms as I have cited.

An analogous case exists with the highest of beings—man. The best authorities agree in saying that notwithstanding the immense structural differences between them, there is yet but one species of *Homo*. The various forms are termed *races*. Why not apply the same terms to such forms as *nephele* and *alope*? They are admittedly one species, and yet locally breed perfectly true to themselves, and except in localities where they intergrade, they are easily distinguished. *Pegala* occupies a similar

position, and so do some of the western forms. All these, as is also the case in the Cicindelidæ cited, are offshoots from the same stock which have varied gradually as they spread over a larger territory, and became gradually local and fixed, but yet show their relationship by their identity of structure.

Satyrus shows no structural differences except a slight one in wing form, separating what I term group *alope* and group *silvestris*. All the species of each group show their intimate relationship.

To Coleopterists I need hardly speak. Dr. Horn takes every opportunity of saying that color and maculation do not alone suffice for specific separation; only structural characters should be recognized.

Lepidopterists have not yet come to that conclusion. Not only is structure not regarded in the question of a new species, but characters are used—color differences—which are known to vary in allied species. Take the species of *Argynnis*, for instance: What are they based upon? Slight variations in maculation, which an examination of a large series of *cybele*, *aphrodite* or *atlantis*, show to be inconstant.

Yet structural characters are by no means wanting in the Lepidoptera. Of over 200 species of *Agrotis* examined by me, two-thirds show obvious differences in structure, and the others differ in other obvious characters exclusive of color.

Of the species of *Mamestra* thus far examined by me, no two agree entirely in structure; and indeed throughout the Noctuidæ good species are very generally separated by distinctive structural peculiarities. That the Diurnals and Bombycidæ show similar variations is almost certain, and as soon as students in these groups will cease to rely upon minute differences in color and maculation, but will accept the facts that western species vary quite as much and perhaps more than eastern species, then will it be possible so to describe a species that it can be recognized.

The tendency of all species is to vary in color and maculation, and the variations also tend to become locally permanent; still these local forms cannot yet be regarded as anything but races—certainly not species, and it is not only confusing, but discouraging, to see a series of *Colias*, *Argynnis* or *Satyrus* all named as species, differing by such trivial characters that one dares not remove a label or change the position of an insect for fear that the species could not be again recognized.

It is thoroughly illogical at all events for a student to accept the theory of evolution, which necessarily precludes the idea of fixedness in species,

and then to make the slightest and most trivial character serve as a basis for a new species, even when it is known that the character is elsewhere in the genus a known variable one.

In my *Satyrus* paper I termed "forms" what I here term "races." The latter is more expressive and more in accordance with the nomenclature in other departments of zoology.

CONTRIBUTIONS TO THE NORTH TRANS-CONTINENTAL SURVEY.

BY LAWRENCE BRUNER, WEST POINT, NEBRASKA.

ORTHOPTERA.

Herewith is presented for publication a partial list of the Orthoptera collected by Dr. H. A. Hagen and Samuel Henshaw during the summer of 1882, along the line of the Northern Pacific Railway. The collection, although not an extensive one, contains some new forms, as well as several interesting varieties of well known species. The collection is also of much interest in extending the range of quite a number of species heretofore recorded as occurring only on the eastern slope of the continental divide, or at the extreme eastern edge of the great interior basin, to the western slope.

Taken as a whole, this collection of Orthoptera is very complete for the regions in which it was made, and shows careful work both in its formation and preservation. It is to be regretted, however, that so few specimens of some of the more interesting forms were taken, a feature which, no doubt, might have been remedied to some extent had their value been known at the proper time.

There still remain a few species which are to be more carefully studied and compared before they can be properly placed. These, when I have the time to do so, will be worked up, and, in connection with the doubtful ones here enumerated, will form the subject for a future paper, when, it is hoped, I will be able to add such points as have been carelessly overlooked here.

ACRIDIDÆ.

Stenobothrus æqualis Scudd. Quite a large series of what appears to be this insect were taken July 16, at Yakima River. The specimens differ from eastern ones in several respects, but not enough to warrant describing them as new. The occiput is a trifle longer than usual, and the middle row of spots on the tegmina extends almost to the tip. There are males and females of both greenish and brownish-gray colors.

Stenobothrus coloradus Thos. A few examples of the ordinary form on Yakima River, July 16.

Stenobothrus curtipennis Scudd. This trim little species is represented by quite a large number of specimens, among which at least three well marked varieties occur. They were taken at various points along the Yakima River in July.

Stenobothrus sp.? A single specimen of a species resembling *S. brunneus*. and perhaps that species, but so badly damaged that it is difficult to place it with a certainty. Same locality as the preceding.

Chlocaltis abdominalis? Thos. The collection contains a single male which is doubtfully referred to this species. Locality not noted.

Aulocara elliottii Thos. This species was numerous at Yakima and Ellensburg, as well as at many other points in eastern W. T. Among the specimens examined I find two well marked varieties which agree with Mr. Scudder's description of *A. cæruleipes* sufficiently close to be referred to that species, which is a synonym of *Stauronotus elliottii* Thos.

Dissosteira carolina Linn. Three specimens of this wide-spread species were taken at Portland, Oregon.

Circotettix undulatus Thos. A few at Yakima, July 16.

Circotettix carlingianus Thos. Same locality as the preceding.

Trimerotropis suffusa Scudd. A few specimens from some point in Washington Ter. which I neglected to note when they were examined.

Trimerotropis vinculata Scudd. W. T.

Trimerotropis pseudofasciata Scudd. A single male from some point in eastern W. T. This species was found by me on Birch Cr. in central Idaho, where it was quite common during July and August, 1883.

Trimerotropis cæruleipennis, n. sp.

Distinct from all other North American species with which I am acquainted in the coloring of the wings.

Wings without the median dusky band, faint cœrulean blue at the

base. Tegmina with the dusky markings not forming definite bands as a rule.

Vertex between the eyes rather broad, bounded by a sharp wall, with a well defined carina running longitudinally through the middle; frontal costa moderately prominent, contracted a little at its upper end and at the ocellus, widening below; sulcate throughout, deepest at the ocellus, the bounding walls or carinæ sharp, reaching the clypeus. Antennæ normal. Pronotum with the anterior lobes a trifle more contracted above than usual, the median carina distinct throughout, considerably elevated on the anterior lobes where the disk is much swelled and tuberculate. Tegmina rather narrow, extending beyond the abdomen one third their length. Posterior femora reaching the tip of the abdomen.

The general color is a dirty grayish yellow or yellowish brown, profusely flecked with irregular brownish dots. Face and sides of pronotum, with the anterior and middle legs, dirty whitish gray, densely flecked with various shades of brown; there are a few black dots and dashes along the carinæ of the face, pronotum and posterior femora. Antennæ annulated with alternate rings of testaceous and obscure brown. Tegmina cinereous brown on the basal two-thirds, transparent on the apical third, flecked with numerous small, quadrate, obscure brown spots, which, in some specimens, are pretty evenly distributed over the wing, while in others they are gathered into three irregular bands, the basal one occupying the basal third, the middle one the centre, and the other the apical third of the wing; beyond this the principal veins are brown, while there are also a few of the quadrate spots scattered at random. Wings beautiful sky-blue at base, gradually fading toward the middle, where the colored portion terminates. At this point and where the fuliginous band usually occurs, the nerves and nervures are dark, but otherwise there is no indication of a dusky band. Beyond this the wings are perfectly transparent, with nerves and nervures near the apex dusky. The upper portion of the thoracic and basal abdominal segments is tinged with a faint bluish color. Posterior femora with two dusky spots on the upper edge which are continued as black bands on the inner face, where the apex is also black; posterior tibiæ glaucous, with the inner base black, followed below by a rather wide yellowish white annulus, spines black-tipped: tarsi bright yellowish white. Lower surface dirty whitish.

Length of body, ♂ 20 m.m., ♀ 28 m.m.; of antennæ, ♂ 7.5 m.m.;

♀ 9.5 m.m.; of tegmina, ♂ 22 m.m., ♀ 31 m.m.; of hind femora, ♂ 10 m.m.; ♀ 15 m.m.

Specimens from Umatilla and Yakima, June 26-July 10. There are also specimens of this insect in the U. S. National Museum at Washington, from Montana, Idaho and Wyoming, and I have seen others that were taken in Utah.

Psinidia sulcifrons Scudd. A pair of what I take to be this species from a point in eastern W. T.

Psinidia wallula Scudd. Specimens taken July 18, at Lone Tree, Yakima River, and others at various localities in eastern Washington Terr.

Camnula pellucida Scudd. The collection contains quite a large series of this destructive locust, obtained at various points in Washington Territory during the month of July. Most of the specimens examined are of a rather darker color than usual in Pacific Coast representatives of this species.

Arphia tenebrosa Scudd. Quite a large series of specimens from La Chapples, on the Yakima River. These are of the variety described by Stal as *A. sanguinaria* in his Orthoptera Recentia.

Hippiscus montanus Thos. A few specimens taken at Camp Umatilla, W. T., June 27.

Hippiscus lineatus Scudd. Colville, W. T., July 24.

Hippiscus lineatus (?) Scudd. Var. The collection contains a few specimens of an insect agreeing with this species in all other respects, save the humeral vitta of the tegmina, which are wanting in these. The tegmina are also more equally flecked with small dusky spots than in typical specimens. Taken July 4-16 at various points along the Yakima River.

Hippiscus Haldemannii Scudd.? Several specimens doubtfully referred here, but do not know just where taken.

Hippiscus corallipes Hald. Several specimens which appear to belong here.

Pezotettix borckii Stal. The collection contains a single female which I refer to this species, from a point in eastern W. T.

Pezotettix hispidus, n. sp.

Without tegmina or wings. Body robust, glabrous, striped with yellow and piceous; posterior femora reaching beyond the extremity of the abdomen in both sexes. Hispid throughout.

Vertex between the eyes moderately broad, depressed, broadly and quite deeply sulcate, the sulcus broadening gently anteriorly where it is open, with a faint longitudinal carina through the centre ; the lateral walls prominent, rather broadly and roundly angled, highest just above the upper canthus of the eyes ; fastigium coarsely punctate. Frontal costa prominent, nearly equal, as broad as the front edge of the fastigial sulcus ; deeply sulcate throughout. Lateral carinæ diverging, reaching the lower corners of the face. Lateral ocelli very prominent, larger than the ocellus of the frontal costa, of a bright amber color. Antennæ as long as the head and thorax combined, the basal joint large, as wide as long, second joint pyriform. Eyes of moderate size, rather prominent, nearly globular (male), or with the front edge almost straight (female). Pronotum equal in the male, expanding posteriorly in the female ; median carina slight but visible throughout, most prominent in the female, lateral carinæ obsolete ; front margin straight, posterior margin slightly truncate, posterior lower angle nearly a right angle. Meso- and metanotum not differing on the dorsum from the basal abdominal segments. Abdomen tapering evenly and gradually posteriorly, sharply carinated ; last segment in the female greatly contracted, valves of the ovipositor exserted, reminding one of the structure of these parts in *Tettigidea ;* male abdomen with the last ventral segment pointed, the apex squarely docked and slightly but roundly notched. Supra-anal plate a little longer than broad, somewhat triangular, the posterior margin gently rounded, the apex slightly produced. Anal cerci cylindro-conical, directed upward and a very little backward, the extreme tip slightly contracted to a rather sharp point. Female cerci cuneiform, directed backward. Posterior femora moderately robust, but not greatly thickened at the base, with all the carinæ prominent and sharp, extending beyond the abdomen in both sexes. Posterior tibiæ normal ; tarsi with the first and third joints equal.

General color brownish piceous above, yellowish beneath. Face, lower half of the deflected lobes of the pronotum, and under surface of the body, with the anterior and middle legs ochraceous (female) or citrinous (male). Antennæ fuscous. A bright yellow line commencing on the lateral margins of the fastigial sulcus and extending backward on each side of the occiput across the pronotum at the outer edges of its disk to the tip of the abdomen, enclosing along the middle a line of the brownish piceous. Below these, on the sides, a broad stripe of the upper surface color, extending from the hind margin of the eyes to the tip of the abdo-

men, separating the dorsal yellow stripes from the yellowish under surface, enclosing on the meso- and metapleura a bright yellow patch and oblique line. Posterior femora with the disk and upper edge brownish yellow or yellowish fuscous, inner side with lower sulcus bright red; upper surface with very faint indications of the usual dark bands. Posterior tibiæ yellowish brown, becoming paler apically, a broad yellowish annulation near the base, spines black tipped.

Length of body, ♂ 18.5 m.m., ♀ 21 m.m.; of antennæ, ♂ 9.25 m.m., ♀ 10 m.m.; of pronotum, ♂ 3 35 m.m., ♀ 4 m.m.; of hind femora, ♂ 11 m.m., ♀ 11.5 m.m.

Colville, W. T., July 24.

This insect has been placed here provisionally, but will have to be removed to its proper place when the section of the family to which it belongs has been properly worked up in this country.

Pezotettix washingtonius, n. sp.

Yellowish white beneath, ferruginous above. Tegmina pointed, nearly two-fifths as long as the abdomen.

Head rather small, short: seen from the front somewhat quadrate. Vertex between the eyes a little wider (male), or once again as wide (female) as the first antennal joint, much depressed; deeply sulcate in the male, scarcely so in the female: sides nearly parallel, broadening slightly anteriorly; front margin not closed. Frontal costa rather prominent, nearly equal, contracted a trifle at the fastigium, edges rounded, not sulcate, rather coarsely punctured above the ocellus. Eyes large, rather prominent, rounded posteriorly, straight in front; equaling in length the portion of the cheeks below them. Face slightly arcuate, somewhat oblique. Pronotum with the sides nearly equal (male), or broadening slightly posteriorly (female); median carina distinct on the posterior lobe and the front margin of the anterior lobe in the male, and on the posterior lobe only in the female; lateral carinæ, or rather the lateral angles, middling sharp, nearly equal throughout, cut by the middle and last transverse incisions; disk punctulate; the three transverse sulci or incisions deep, the middle and last passing the lateral angles to the sides, posterior one about the middle. Sides of the pronotum somewhat gibbous, appearing as if composed of three well-defined lobes or segments when observed from above, most apparent in the male. Front margin nearly straight, very slightly truncate; posterior margin obtusely rounded. Meso- and meta-

thorax rather longer than usual, thereby throwing the base of the posterior femora about (female) or back of the middle of the body (male), and giving it a rather "long-waisted" appearance. Tegmina extending upon the second abdominal segment, ovate-lanceolate, meeting upon the dorsum. Abdomen carinated, rather slender; the last ventral segment of the male upturned, prow-shaped, with the point produced into a blunt projection; cerci rather long, the width about one third the length, directed a little backward and inward with the apex rounded and curving slightly forward; supra-anal plate triangular, the apex rounded and minutely notched, with a long, deep central foveola; marginal apophyses of the preceding segment small, wart-like projections. Posterior femora inflated at the base, rather smooth, extending beyond the apex of the abdomen. Prosternal spine large, conical, transverse, rather long, and directed backward. Antennæ normal, a trifle longer than the head and pronotum combined.

The general color is testaceo-ferruginous above, yellowish beneath. Face, occiput and disk of the pronotum flecked with numerous minute fuscous dots, which run together in some specimens and form rather large irregular blotches; a broad piceous band extending from the posterior edge of the eye along the upper margins of the lateral lobes of the pronotum to the last transverse incision. Meso- and meta-pleura dark brown or black with a stripe of the light color extending from the base of the tegmina to the insertion of the posterior femora. Tegmina dark brown with a few irregular, fuliginous dots along the middle area; nerves a little lighter. Posterior femora testaceous, with the base and two rather dim bands fuscous, these bands being plainest on the upper edge. There are also a few black dots along the lower edge of the disk and about the apex. Posterior tibiæ bright red, with the knee and spines black. Antennæ testaceous, becoming slightly infuscated apically.

Length of body, male 18.5 m.m., female 22 m.m.; of antennæ, male and female 8 m.m.; of tegmina, male 5.5 m.m., female 6 m.m.; of hind femora, male 10.5 m.m., female 12 m.m.

A large series at Loon Lake, Colville Valley, Washington Terr., July 25th.

Pezotettix enigma Scudd. Yakima River, July 16, and other localities in W. T.

Bradynotes opimus Scudd. Ten specimens of this clumsy, wingless locust were taken on Yakima River opposite Ellensburg, July 8, 9.

Bradynotes montanus, n. sp.

Small, comparatively slender, dark reddish brown, with livid yellow and white markings; tegmina sometimes obsolete, when present as in *Pezotettix gracilis*.

Vertex between the eyes very broad, slightly deflected, scarcely sulcate, with a very faint though perceptible transverse depressed line joining the upper extremities of the eyes, this line bending forward so as to form a gentle arc with the convexity to the front. Frontal costa moderate, nearly equal throughout, expanding a little at the ocellus, where it is very shallowly sulcate. Pronotum simple, expanding equally and rapidly posteriorly in the female, nearly equal in the male; front margin straight, posterior margin slightly but broadly truncate; median carina of the pronotum slight, visible throughout, on the anterior lobe as a mere smooth line not elevated in the least, in some specimens represented by a very faint depressed hair line, on the posterior lobe slightly elevated, the sides gently tapering; lateral carinæ obsolete, except in some specimens where they are visible on the extreme front edge of the anterior lobe as blunt shoulders. Anterior lobe coarsely and somewhat distantly, and the posterior minutely and thickly punctate, rugulose. Abdomen carinate, tapering gently and evenly backward. Tegmina situated low on the sides, small, straight, narrow, three times as long as broad, the apex rounded. Posterior femora short, somewhat tumid, nearly (female), or just reaching the tip of the abdomen (male). Last ventral segment of the male abdomen upturned, prow-shaped, entire; cerci elongate conical, with the tips directed backward and gently downward, reaching a trifle beyond the tip of the supra-anal plate. This latter very similar to that of *B. obesus*, but proportionally broader apically. Female cerci mere rudiments, while in *B. obesus* and *B. opimus* they nearly equal those of the male.

The general color is dark reddish brown with livid yellow and white markings above, flavous beneath. Face griseous yellow, becoming darker above, the vertex and occiput brownish fuscous; a very narrow but sharply defined yellow line commencing near the upper posterior angle of the eye, separating the occiput from the genæ and extending backward on to the pronotum, where the lateral carinæ would be if present; in some specimens a third line of a similar nature is present, beginning at the vertex and extending backward along the middle of the occiput. Sides of pronotum yellowish white, with a broad brownish piceous band extending from near the middle of the anterior lobe obliquely upward to the posterior

transverse incision; posterior lobe with the dorsal surface much lighter colored than the anterior lobe. Abdomen with a bright yellowish white line following the dorsal carina its entire length, this line bordered below by a black line followed by a medium broad band of the general color above; below this last band the sides of the abdomen are dull blackish or fuliginous. All these lateral lines and stripes fade away apically. Posterior femora brownish testaceous above, with the upper carinæ and inner and outer upper half of the apex black; there are very faint traces of the usual dusky bands present on the upper surface. Tibiæ yellow, spines black-tipped, tarsi yellowish with a lurid tinge.

In the living insect the colors are much brighter and contrast very strongly. The yellowish hair lines and dorsal line of the abdomen are glossy white, while the front and lower surface are of a bright lemon yellow. The brown is a bright hazel.

Length of body, male 17 m.m., female 22 m.m.; of pronotum, male 3.85 m.m., female 4 m.m.; of antennæ, male 6 m.m., female 6.75 m.m.; of tegmina (when present), male 2.25 m.m., female 2 m.m.; of hind femora, male 8.5 m.m., female 10 m.m.

Habitat.—Colville, Loon Lake, Washington Terr., July 23-25 (Dr. H. A. Hagen): also near Helena, Montana, among the trailing junipers on north mountain slopes at moderate elevations (L. Bruner). There were a few pairs in the present collection taken as cited above.

Melanoplus atlanis Riley. The collection contains quite a number of specimens that must be referred to this wide-spread and everywhere abundant species, although they vary considerably from typical specimens taken at the east. At various points in Washington Territory.

Melanoplus cinereus Scudd. Lone Tree, Yakima River, July 18.

Melanoplus infantilis Scudd. The collection contains a single female of this small species, which was taken at some point in eastern W. T.

Melanoplus curtus Scudd. A pair of short-winged Melanopli which are referred to this species without hesitation. This species is very closely related to *M. rectus*, an insect found in the mountains of New England.

Melanoplus femur-rubrum DeGeer. The collection contains but a single male specimen of this species, which comes near *M. interior* Scudd.

Melanoplus minor Scudd. There are two males of this well-marked species, which has, at various times, been referred to *Caloptenus occidentalis* Thomas, but which is quite distinct from that species. They were taken in eastern W. T.

Melanoplus Packardii Scudd. There are quite a number of this species in the collection, taken at Umatilla, Oreg., and also near Ellensburg. These specimens are interesting since they all have the hind tibiæ red instead of bluish, as in the typical specimens from Nebraska and neighboring States.

Melanoplus extremus Walker (?). The collection also contains a few specimens of a *Melanoplus* which is referred with some doubt to this species of Walker's. The insect in question is somewhat closely related to *M. atlanis* Riley, but differs from this species in its larger size, more robust form, comparatively shorter tegmina and wings, the much longer and more upturned last ventral segment of the male abdomen, and in the longer and broader cerci of the male. The general color is a dirty yellowish with markings of dull brown and black, arranged much as in *M. atlanis*. The female can be distinguished from that of *atlanis* in its more robust form and the much heavier and more rounded prosternal spine. Hind tibiæ dull yellow, with a very faint brownish tinge in some specimens.

There are also specimens of this insect in the collection of the U. S. National Museum from Ft. McLeod, British America, and Helena, Ft. Ellis and the Madison Valley, Montana, and also Salmon City, Idaho

Melanoplus femoratus Burm. A few specimens from W. T.

Melanoplus ——— sp. The collection also contains a few specimens of what appears to be still another species somewhat closely related to *M. atlanis* and *M. scriptus* Walk , but which were not critically examined when the specimens were before me. These were also taken in W. T.

There are also quite a large number of specimens of the genus *Tettix* which I have not tried to determine, of which there are at least two species. I expect, however, to work up this section of the Acrididæ after I have more material at my command than at present.

GRYLLIDÆ.

Gryllus luctuosus Serv. ? The specimens in the collection which are referred to this species with some hesitation, are all females, and have the ovipositor very long, 16 m.m. Taken at Spokane, W. T., and Umatilla, Oreg.

Gryllus neglectus Scudd. There are five females of another species which are referred here. They have the ovipositor 10 m.m. in length. Portland, Oreg.

Gryllus ——— sp. Still another species of *Gryllus* is represented in the collection by two females and one male. These are somewhat larger than the preceding species and have the ovipositor 12.5 m.m. in length. One female taken at Portland, Oregon, June 19, a second at Camp Umatilla, June 27, and the third, a male, at Yakima River, July 18.

Gryllus ——— sp. The collection contains a single specimen of a fourth species, a female also. It has the posterior femora quite long and robust, reddish brown, and ovipositor of the same color, length of latter 13.75 m.m. Camp Umatilla, June 27.

Œcanthus ——— sp. I find in this collection some pupæ of an *Œcanthus*, probably *Œ. niveus*. Locality not noted.

There are also specimens of the following genera of Locustidæ that have not been carefully compared: *Udeopsilla*, 2 sp.; *Dectes*, 2 sp.; *Anabrus*, 1 sp.; *Stenopelmatus*, 1 sp.; *Orchelimum*, 1 sp.; *Xiphidium*, 1 sp.; *Ceuthophilus*, 1 sp.; and a single larva of a Mantid.

LARVA OF CHRYSOMELA CLIVICOLLIS, Kirby.

BY G. H. FRENCH, CARBONDALE, ILL.

Length .30 of an inch; abdomen nearly globular, flattened beneath; head and thorax narrow. Head pale grayish yellow; thorax and abdomen pale gray, a dorsal blackish line on the abdomen and a transverse stripe of the same on the thorax. Stigmata black, legs pale, the articulations dark; two black spots on each side of the head. Body smooth, shining, a few hairs on the anterior part.

Chrysalis.—Length .40 of an inch; thorax, wing and leg cases rose pink, as also the under side of abdomen; upper side of abdomen pinkish gray with a dorsal pink line. Stigmata black. Each joint of abdomen has a transverse row of black points on its posterior edge.

This larva was found feeding on the leaves of *Enslenia albida*, a vine of the milk-weed family, August 21, 1884. Several times the beetles have been found on a prickly ash bush that grows not far from where this vine has grown in my yard for a number of years, but I could not see that they had eaten the leaves of the bush; but last summer both the larvæ and beetles were found on this vine eating the leaves, establishing the fact of food plant. The larva pupated September 2nd, and the imago appeared September 8th, giving six days as a pupal period.

CORRESPONDENCE.

Dear Sir: In my collecting notes for 1883 I find the following items:

"June 24. Took upon the ground under a white-wood tree, a male *Callosamia promethea*, with peculiar marks upon front wings."

"June 27. Two specimens of *promethea*, male and female, both showing the peculiarity of markings noticed in the one captured on 24th inst."

These were fresh specimens, evidently just hatched, and were found under the same white-wood tree. Examining the bushes and under-brush, I found an empty cocoon, apparently that of *promethea*, hanging to a beech shrub. Never having seen *angulifera*, and knowing there was no name in the Canadian list except *promethea* for such an insect to come under, I placed it in my collection as a variety of that species. Mr. Moffat pronounced it *angulifera* the moment he saw the specimens, and took home with him a male, sending me a male from Mr. James Angus in return. The latter specimen measures 4 inches, while the male of my own capture expands only 3¾, and the female a little over 4½ inches. As Mr. Moffat announced in the June number, these moths were taken near this village. A friend of mine, Mr. Avery, got one in the same woods this summer.

A. H. KILMAN, Ridgeway, Ont.

Dear Sir: In some collecting done the past season near McLean P. O., in the Northwest Territory, I found *Vanessa cardui* common, and during latter half of June saw a good many individuals of *Euptoieta claudia* Cramer. Neither of these butterflies appear in the lists of Capt. Geddes in CAN. ENT., Dec., 1883, and March, 1884. This occurrence of *claudia* is interesting, and to me rather a surprise. The locality mentioned is on the Can. Pac. Ry., 332 miles west of Winnipeg, and about 25 miles south-west of Fort Qu'Appelle.

THOS. E. BEAN.

Dear Sir: Dr. J. G. Morris writes me that he will have later, a letter from the son of the Rev. J. F. Melsheimer, the oldest son of F. V. Mel-Melsheimer. Rev. J. F. Melsheimer was a minister in Hanover from 1814 to 1826. He died in 1829, in Adams Co., Pa., and left three children, all of whom are living.

H. A. HAGEN, Cambridge, Mass.

The Canadian Entomologist.

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THE COLLECTION OF PHYTOPTOCECIDIA, OR MITE GALLS, IN THE CAMBRIDGE MUSEUM.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The very extensive collection of galls from the U. S. presented to the Museum in 1870 by Baron von Osten Sacken, contains all his types. There are 138 different galls of Cynipidæ, gall flies 56 species, guest flies 23 species, parasites 66 species, and from Dr. Reinhard 38 types of European Cynipidæ. Further galls of other insects 121 species (Diptera 70, Hemiptera 30, etc.); the types of B. D. Walsh, galls of Salix, 13 species. To these were later added by the Baron his types of Colorado galls, 12 species, and those of California, 15 species. The permanent aim to enlarge this excellent collection has met with success. The prominent additions from Europe are 88 species from Mr. Brischke, in Danzig, Prussia, and 96 types of oak galls from Prof. G. Mayr, in Vienna, Austria, and 18 types of mite galls from Dr. Thomas. The additions of N. Am. galls are very numerous; prominent among them are large additions from California, Washington Terr., and Mexico.

There were among the galls of the Baron a small number of mite galls; fortunately, also, the types of the two species described by Mr. Walsh, and a number of fungi. As some deformations of plants by insects are very similar to the deformations by fungi, it was decided best to make also a collection of fungi. For the determination of these and of the mite galls, formerly considered to be fungi, I am deeply indebted to the untiring kindness of Prof. W. J. Farlow, who has also added to the collection a large number of specimens.

The advancement of the scientific knowledge of the mite galls is comparatively new and principally due to the numerous and incessant studies and publications of Dr. Fr. Thomas, in Ohrdruf, Gotha. His yearly Reports in Dr. L. Just's "Botanischer Jahresbericht" are indispensable to the student of mite galls.

The literature of the mite galls of the U. S., as far as known to me, is

small. Mr. B. D. Walsh, 1867, Proc. Ent. Soc. Phil., T. vi., p. 285-287, enumerates 20 species from Illinois, occurring on 14 different genera of woody plants. On Ulmus, 3 species; Populus, 1; Carya, 1; Salix, 2 (and probably several others); Quercus, many Acarideous semi-galls or mere woolly indented deformations of the leaf; Fraxinus, 2; Betula, 1; Juglans, 2; Crataegus, 1; Prunus, 1; Cerasus, 1; Tilia, 1; Cephalanthus, 1; Acer, 2; Negundo, 1. Only the two species on Salix are named and described.

Mr. H. Shimer, 1869, Trans. Amer. Ent. Soc., T. ii., p. 319, described from *Acer dasycarpum* a gall containing *Vasates quadripedes*, nov. gen. and sp. Mr. J. A. Ryder, 1879, Amer. Naturalist, T. xiii., p. 704, describes an Erineum on Acer.

Mr. W. H. Ashmead, 1879, CAN. ENT., T. xi., p. 159, describes *Thyphlodromus oiliivorus** of oranges, as the cause of the rust of the fruit.

Mr. T. J. Burrill, 1880, Gardener's Monthly, January, and Am. Ent., T. iii., p. 26, describes *Typhlodromus pyri*, believed to be identical with the same species from Europe, in the pear-leaf blister.

There are in all known 24 species from the U. S., and 6 of them are described.

The following list of the species in the collection is arranged alphabetically after the plants, the species from Europe and those from America separately. The scientific description and the naming of the species will be the work of a monographer, and are not given here, because I believe this collection too small for such a purpose, the more as the mites are not represented.

I. From Europe. All except four by Mr. Brischke are from Dr. Fr. Thomas, to whom belong the notes given with each species. The often quoted paper on Phytoptus was first published in the "Programm der Realschule," etc., zu Ohrdruf, Gotha, 1869, 4th, pg. 29, pl. 1. Reprint, with additions to the paper, in Zeitschrift, f. d. ges. Naturniss., by Giebel Halle, 1869, T. 33, p. 313-366. Both are quoted as Progr., and as Add. Pl. means Pleurocecidia Thom., Acr. means Acrocecidia Thom.

1. *Acer campestre* L. Pl. Ohrdruf, Saxony; fall, 1879. Gall on leaves, *Cephaloneon myriadum* Bremi. Progr. p. 9, No. 9; Add. p. 335.
2. *Acer campestre* L. Pl. Ohrdruf, fall, 1879. *Cephaloneon solitarium* Bremi. Verhandl. d. *St. Gallischen* natur. Gesell., 1870-1871, p. 3.

* Corrected by Dr. Thomas in *oleivorus*.

3. *Acer campestre* L. Pl. (bark-gall on stems). Ohrdruf, 1879. Descr. Giebel's Zeitschr. 1879, T. 52, p. 740-745.
(Achillea millefolium L. Pl. Ohrdruf, fall, 1876.
Tyleuchus millefolii Tr. Loew. Verhand. Z. B. Gess. Wien., 1878. Thomas, Giebel's Zeitschr. 1874, T. 42, p. 522 (separ. p. 12).
The tuberculous leaf-galls are made by Anguillula, and belong not to Phytoptocecidia. I would not omit them, to draw the attention of students to this subject.)

4. *Alnus glutinosa* Gaertn. Pl. Ohrdruf, Sept. 1879; Danzig, Prussia, Brischke. Giebel's Zeitschr. 1869, T. 33, p. 337. Leaf-galls in the angles of the ribs, probably *Erineum axillare* Fée and *Xyloma alneum* Persoon. Mr. Brischke's specimen is labelled *Synerista alni* Kirchner. This is published in Lotos, 1863, p. 46, a work not seen by me.

5. *Alnus glutinosa* Gaertn. Pl. Ohrdruf, 1879.
Erineum alneum Gaertn. on leaves.

6. *Alnus glutinosa* Gaertn. Pl. Danzig, Prussia, Brischke.
Bursifex alni Kirchner, Lotos 1863, p. 46. Thomas Progr. p 8, and Add. p. 334, as *Cephaloneon pustulatum* Bremi.

7. *Carpinus Betulus* L. Pl. Ohrdruf, fall, 1879. Frills and curled folds of the leaves; Steenstrup, quoted by Thomas, Addit. p. 324.

8. *Corylus avellana* L. Acr. Ohrdruf. 1878. Deformation of the buds. Thomas, Addit. p. 319; Dujardin, Ann. Sc. Nat., 1851.

9. *Fagus sylvatica* L. Pl. Ohrdruf, 1879.
Legnon circumscriptum Bremi. Thomas, Addit. p. 341. The margins of the leaves rolled up.

10. *Galium silvestre* Poll. Acr. Sudeten Mts., 1872, August. Thomas in Giebel's Zeitschr. 1877, T. 49, p. 384. (Vergruenung, Thom.)

11. *Lonicera xylosteum* L. Pl. Ohrdruf, June, 1880. Deformation of the margins of leaves. Thomas, Nova Acta Lesp. Carol. 1876, T. 38, p. 277, fig. 25, 26. *Legnon confusum* Bremi.

12. *Orlaya grandiflora* Hoffm. Acr. Dolmar, near Meiningen, August, 1875. Thomas in Giebel's Zeitschr. 1877, F. 49, p. 382 (Vergruenung, Thom.)

13. *Populus tremula* L. Pl. Ohrdruf, 1879. Thomas, Acta Nova l. c., p. 270, pl. x., f. 17-20. Galls on the basal glands of the leaves; the mite is named by Kirchner, Lotos, 1863, p. 45, *Heliazeus Populi;* it is a Phytoptus.

14. *Prunus domestica* L. Pl. Ohrdruf, fall, 1879.
Vulvulifex pruni Amerling. *Cephaloneon hyppocrateriforme* Bremi. Thomas, Giebel's Zeitschr. 1869, T. 33, p. 330, and 1872, T. 39, p. 199. Leaf-galls.
15. *Pyrus communis* L. Pl. Ohrdruf, fall, 1879. Pox or pustules on the leaves. Thomas in Giebel's Zeitsch. 1872, T. 39, p. 473, and Sorauer Pflanzenkrankheiten, 1874, pl. I.
16. *Salix alba* L. Pl. Danzig, Prussia, Brischke. Leaf-galls. *Bursifex salicis* Amerling. Thomas, Progr. p. 2.
17. *Sarothamnus scoparius* Koch. Acr. Baden-Baden, August, 1877. Deformed axillar buds. Thomas in Giebel's Zeitschr, 1877, F. 49, p. 375-377, pl. 6, f. 6. The deformation is considered identical with Reaumur Min. 1737, T. iii., p. 423, pl. 35, f. 1,2.
18. *Sorbus aucuparia* L. Pl. Ohrdruf, 1879. Erineum, on the leaves.
19. *Thymus serpyllum* L. Acr. Ohrdruf, August, 1876. Deformation of the tips of buds.
20. *Tilia Europaea* L. Pl. Danzig, Prussia, Brischke. *Botherimus Tiliæ*, leaf-galls.

II. From North America.

21. *Acer rubrum* L. Pl. Washington, D. C. O. Sacken. Cephaloneon spec., numerous galls on the upper side of the leaves.
22. *Acer rubrum* L. Pl. White Mts., N. H., Sept. 1869. H. Hagen. Cephaloneon, on old leaves; galls in large numbers dispersed on the leaves.
23. *Acer rubrum* L.? Pl. Lynfield, Mass., June 13, 1867. H. Hagen, Cephaloneon; the upper side of very young leaves closely, almost entirely, covered by the galls.
24. *Acer saccharinum* Wang. Pl. W. St., O. Sacken; Cambridge, Mass., H. Hagen. Erineum, on the ribs, rather elongated.
25. *Acer saccharinum* Wang. Pl. Shelburne, N. H., August, 1882. Prof. Farlow. *Erineum roseum* Schult. (Farlow); small velvety patches on the upper side of the leaves.
26. *Acer dasycarpum* Ehrh. Pl. Shelburne, N. H., August, 1882. Prof. Farlow. *Erineum luteolum* Farl.; irregular velvety rusty patches on the under side of the leaves.
27. *Acer* spec. Pl. Illinois, spring, 1869. H. Shimer. Not seen by me;

Trans. Amer. Ent. Soc., T. ii., p. 319. Cephaloneon, perhaps the same as No. 23. The mite is *Vasates quadripedes* Shimer.

28. *Acer* spec. Pl. Prof. Barbeck. Not seen by me; Erineum. Mr. John A. Ryder, Amer. Naturalist, 1879, F. 13, p. 704-705. The mite is figured.

29. *Acer* spec. Pl. Bethlehem, N. H., August, 1870. Prof. L. Agassiz. "*Erineum purpurascens* (so called); not supposed to be a fungus, but a disease of the epidermis." Prof. Farlow. Large irregular black velvety patches upon the leaves.

30. *Alnus incana* Wied. Pl. Shelburne, N. H., Aug., 1882. Prof. Farlow. *Erineum alnigerum* Kze. (Farlow); small reddish or whitish flat woollen patches on the upper side of the leaves.

31. *Alnus serrulata* Ait. Pl. W. St., O. Sacken. Very small, widely scattered Cephaloneon galls on the upper side of the leaves.

32. *Alnus serrulata* Ait. Acr.? W. St., O. Sacken. A hypertrophy of the female aments by a fungus. *Taphrina alnitorque* Tulasne = *Ascomyzes Tarquinetii* Westendonk (Farlow). Baron O. Sacken believed it to be an Acarideous deformation; perhaps fungus and Acarus may be combined here. A hemipteron, *Cymus Resedæ* Pz., lives abundantly in the early spring in this deformation.

33. *Amelanchier Canadensis* Gray. Pl. Woods Holl, August, 1876. H. Hagen. Galls similar to a Phrygian cap, the tip rolled down, numerous on the upper side (rarely below) of the leaves; on the under side the Erineum opening. Mostly many galls on the same leaf.

34. *Amelanchier Canadensis* Gray. Pl. S. Truro, Mass., July 3-7, 1877. F. G. Sanborn. Similar to the foregoing, but a number of the galls larger, yellowish, the open tip woolly on the margin. Perhaps the ripe form of the foregoing.

35. *Aristolochia sipho* L. Herm. Pl. Harvard Arboretum, June 17, 1882. H. Hagen. Small woollen tuberculous galls on the underside of leaves; above small rounded openings, with white woollen margins. I am not entirely sure that it belongs to Acarus.

36. *Artemisia* spec. Acr. N. England. Prof. Farlow. Deformation of the buds; black globes of densely crowded filaments.

37. *Betula* spec. Acr. Massachusetts, 1880, November. Prof. Farlow. Densely crowded irregular deformations of the buds.

38. *Carya tomentosa* Nutt. Pl. Washington, D. C., June 13, 1861. O.

Sacken. Labeled as *Pemphigus caryæ venæ* by O. Sacken. The description of A. Fitch, Rep. iii., p. 444, for *Carya alba*, agrees ; by B. D. Walsh, Pract. Entom., T. i., p. 3, it was declared to belong to Coccus, which is not accepted by Prof. Comstock. Perhaps it belongs to Phytoptus.

39. *Carya tomentosa* Nutt. Pl. U. S., O. Sacken. Deformation and folds on the leaves.

40. *Clematis* spec. Pl. Yakima City, Wash. Terr., July 3, 1882. S. Henshaw. Small, short whitish tubes, open at the end, crowded in oblong convex patches on the leaves, but also on the stalks of the buds and on the buds, therefore it would belong to Pl. and Acrocecidia.

41. *Cornus Canadensis* L. Pl. Mount Monadnok, N. H., Sept. 1883. Prof. Farlow. Erineum spec. Small blackish spots on the upper side of the leaves.

42. *Crataegus tomentosa* L. Pl. Rock Isl., Illinois, O. Sacken. Sent by B. D. Walsh as *Acarus crataegi vermiculus* Walsh. Leaf-curls. Proc. Ent. Soc. Phil. T. vi., p. 227.

43. *Crataegus crus-galli* L. Pl. Rock Isl., Illinois. O. Sacken. The same as the foregoing.

44. *Crataegus coccinea* L. Pl. Worcester, Mass., Sept. 7, 1879. Miss E. Sargent. Spinulose blackish galls on the upper side of the leaves.

45. *Diospyros Virginiana* L. Pl. Washington, D. C., Oct. 26, 1860. O. Sacken. Erineum, on the upper side of the leaves ; small rounded, slightly elevated patches in great numbers.

46. *Elodes Virginica* Nutt. Pl. Illinois. Prof. Farlow. Very fine and very numerous black spots on the upper side of the leaves.

47. *Fagus ferruginea* Ait. Pl. Shelburne, N. H., August, 1882. Prof. Farlow. *Erineum ferrugineum* P. (Farlow). Irregular velvety rusty patches on the under side of the leaves.

48. *Fraxinus* spec. Pl. Massachusetts, 1880. Prof. Farlow. Cephaloneon, densely crowded, covering about the whole leaves above.

49. *Gerardia flava* L. Pl. Martha's Vineyard, Mass., August, 1872. H. Hagen. Deformation of the leaves.

50. *Juglans cinerea.* Pl. U. S. O. Sacken. *Erineum anomalum* Farl. It is the same mentioned by Walsh, Proc. Ent. Soc. Phil., T. vi., p. 227, "on the leaf stalk of the Black-Walnut gall. *Juglandis*

caulis Walsh, M.S., they reside among the brown external pubescence." The whole stalks are covered around by a thick brown velvet to the length of one inch. If I did not know the scrupulous accuracy of the Baron in labeling his specimens, I should believe that the specimens in the collection are types of Walsh sent to him, as they are indeed very similar to the preparation used by Walsh. I know nothing similar to this curious gall.

51. A leguminose plant. Pl. Santa Cruz, Cal., 1879. Prof. Farlow. The leaves are sprinkled above densely by very small black spots. The gall is very similar to those of *Elodes Virginica*.

52. *Plumbago* spec. Pl. Santa Cruz, Cal., 1879. Prof. Farlow. Galls similar to those of *Elodes Virginica*, but less numerous.

53. *Potentilla Pennsylvanica* L. Pl. Saskatchewan, Br. Amer., 1884. Prof. Farlow. Erineum, on the leaves; somewhat doubtful.

54. *Prunus maritima* Wang. Pl Waquoit, Mass., June, 1871. L. Agassiz. Deformation of the leaves.

55. *Prunus maritima* Wang. Pl. Woods Holl., Mass., August, 1876. H. Hagen. Long pedunculated black galls on the upper side of the leaves.

56. *Prunus maritima* Wang. Pl. Mass. H. Hagen. Similar to the foregoing, but probably a different species. The galls are green, smaller and much shorter pedunculated.

57. *Prunus serotina* Ehrh. Pl. Maryland. O. Sacken. Galls similar to those on *Pr. maritima* from Waquoit, No. 54.

58. *Prunus serotina* Ehrh. Pl. Westpoint, N. Y. O. Sacken. Galls similar to those on *Pr. maritima* from Mass. No. 56.

59. *Prunus serotina* Ehrh. Pl. Plum Creek, Col., June 27, 1873. O. Sacken. Similar to the foregoing, but different by shorter and most densely crowded galls.

60. *Prunus?* spec. Pl. Massachusetts, 1876. F. G. Sanborn. A very large Erineum.

61. *Prunus serotina* Ehrh. Pl. Cambridge, Mass., 1874. Mr. Bassett. Galls similar to those from Maryland, No. 57.

62 *Prunus*, spec. Pl. Weenass Valley, Wash. Terr., July 7, 1882. S. Henshaw. Small yellow pedunculated galls; very crowded on the upper side of the leaves, and around some stalks.

63. *Pyrus coronaria* L. Pl. Rock Isl., Illinois. O. Sacken. Erineum, on the under side of the leaves. I find it not described.

64. *Quercus bicolor* Wilden. Pl. Conn., by Mr. Bassett. O. Sacken. Upper side of leaf crowded with very small Cephaloneon; labeled as Podosoma.

65. *Quercus obtusiloba* Mich. Pl. Washington, D. C., October. O. Sacken. Deformation of leaves on the margin.

66. *Quercus* spec. Pl. Saltillo Mts., Mexico, Aug., 1879. Dr. Palmer. Deformation of leaf on margins.

67. *Quercus* spec. Pl. Colorado, 1873. W. L. Carpenter. O. Sacken. The gall belongs not to the three species described by the Baron in Hayden's Report for 1873, p. 567. The galls were labeled "Russ (sic.) galls," and are somewhat doubtful; oval, somewhat woolly, on the upper side of the leaves.

68. *Rhus toxicodendron* L. Pl. Malden, Mass., Sept. 1879. H. Hagen. Erineum, on the leaves.

69. *Salix nigra* Mars. Acr. Rock Isl., Illinois, Walsh. O. Sacken. The types of *Gall. Salicis Aenigma*. Walsh, Proc. Ent. Soc. Phil. T. iii., p. 608, and T. vi., p. 227. Deformation of the buds.

70. *Salix nigra* Mars. Pl. Rock Isl., Illinois, Walsh. O. Sacken. The types of *Gall. Salicis semen* Walsh, Proc. Ent. Soc. Phil., T. iii., p. 606, and T. vi., p. 227. Probably a Cephaloneon.

71. *Salix nigra* Mars. Pl. Wash. Terr., opposite Umatilla, June 27, 1882. S. Henshaw. Small and very crowded Cephaloneon galls upon the leaves.

72. *Spiraea* spec.? Pl. Cambridge, Mass., spring, 1877. H. Hagen. Probably Cephaloneon on the leaves.

73. *Tilia Americana* L. Pl. U. S. O. Sacken. Very shortly pedunculated galls on the upper side of the leaves.

74. *Thuja occidentalis* L. Pl. Mass., July, 1879. Prof. Farlow. Covered with eggs and skins; deformation of the leaves.

75. *Vaccinium* spec. Pl. Colville Valley, Wash. Terr., July 23, 1882. S. Henshaw. Small round galls on the leaves.

There are besides in the collection a number of specimens not yet sufficiently studied, as some cases of Phyllomania or Polyphyllia on pines and other plants, perhaps consequences of Phytoptus.

To the 51 American Phytoptus galls in the Collection of the Museum, must be added the four described, but not seen by me; by Mr. Shimer, on *Acer dasycarpum;* by Mr. Ryder, on *Acer;* by Mr. Ashmead, on oranges, and by Mr. Burrill, on pear leaves. Further, two shortly described

by Mr. Walsh (Proc. Ent. Soc. Phil., T. iii., p. 608, after the statements l. c., T. vi., p. 286) on *Betula nigra* and *Cephalanthus occidentalis*, both probably Cephaloneon. Further, after the list of Acarideous galls given by Mr. Walsh (l. c., T. vi., p. 285-286), 3 on Ulmus, 1 Populus, several on Quercus, 1 Juglans, 1 Negundo—in all 13 species not seen by me. Of these 68 galls, 56 are Pleurocecidia.

The 68 Phytoptus galls known from N. America belong to 42 species of plants, to 33 genera, and 23 families. Prunus has 7 different galls, Acer 5, Quercus at least 4; all other plants have less, mostly one gall.

It is obvious that this list is only a beginning of the knowledge of the Phytoptus galls in N. America, when we look on the large number of species discovered in Europe since more attention is given to them, principally by the untiring efforts of Dr. Fr. Thomas.

ENTOMOLOGICAL NOTES.

BY J. G. JACK, CHATEAUGUAY BASIN, QUEBEC.

The following notes on the habits of several insects are from a record of entomological observations kept during the past four years, and although imperfect, they may serve as a hint to others to pursue observations in the directions indicated.

During the past season few unusual specimens were taken and very few notes made. Diurnal Lepidoptera (with the single exception of *P. cardui*, which had been rare for some years) were unusually scarce. *Pieris rapæ* is becoming less numerous every year, owing, probably, to its many parasites. Moths were not so abundant as usual, and the only capture worthy of notice was the re-occurrence of *Aletia xylina* Say (the cotton-worm moth), a single good fresh specimen of which was taken October 26th, in the woods, among leaves near a butternut tree. There had been severe frost the night before, but the moth was quite lively when found. Looking through my note book, I find the following entries regarding this insect:—

"October 1st–15th, 1881. Found *Aletia xylina* Say quite common, especially in open barrels or heaps of decaying apples left in the orchard."

"Sept. 21, 1882. *Aletia xylina* Say taken at decaying fruit."

"Oct. 12, 1883. *Aletia xylina* Say taken at decaying apples. Not very common this year."

The decaying apples mentioned were windfalls that had been partly eaten by other insects before they were gathered, and put into heaps or old barrels to be fed to cattle. When these apples had stood in the sun a few days, the smell of ripe fruit from them became quite strong, and many moths, flies, etc., were attracted. It was here I found *Aletia xylina* most common, resting quietly on the bitten apples, and easily taken with the hand. They are nearly always in good condition, and although they are not easily "rubbed" and have the power of long sustained flight, I find it hard to agree with Professor Riley's opinion that they fly here every autumn from the Southern cotton fields. I think we will yet find there is a Northern food plant.

Dec. 30th, 1881. Found more than one hundred pupæ of *Drasteria erechtea* Hub. in a hollow piece of wood. They must have been collected and placed here by some small animal, possibly a wood-mouse.

Jan 9, 1882. Found several examples of hybernating *V. milberti* under stones in a stone fence. I thought it worth noting that two or more were almost always found under the same stone or near together, and a considerable distance might intervene between each lot of specimens.

July 25, 1882. Several specimens of *V. antiopa* taken hovering over bushes of choke cherry *(P. virginiana)*, the leaves of which were much infested with aphides. The butterfly would alight on the curled leaves containing the aphides, and extending its tongue, insert it among them, and when engaged drinking the sweets furnished by the aphides, it could readily be taken with the hand. *Limenitis arthemis* and *L. disippus* were observed and taken similarly occupied. At a meeting of the Cambridge Ent. Club (Jan. 12th, 1883) I asked the members present if they had observed or known of such habits in these butterflies before, and received a negative reply. Also notice that *Phyciodes tharos* and other small red butterflies sometimes persistently follow *D. archippus* and other large butterflies of the same color. They alight when the large butterfly does, rising only when the larger insect takes to flight again. Is this for the sake of protection from some enemy?

The following note was made at the Experiment Grounds of the "Rural New-Yorker," River Edge, Bergen Co., N. J.:

"July 7, 1883. Found *Pronuba yuccasella* Riley in flowers of *Yucca filamentosa*. They are quiet during the day time, but become active in

the evening. Have not found them anywhere except in or upon flowers of this plant. Also observed a Humble-bee succeed in entering two or three of the flowers, and, clasping the stamens firmly with its legs, it reached the base of them with its tongue and usually went two or three times around. It had much difficulty in getting into the flowers. No other insects were observed about them. Could this bee fertilize *Yucca* flowers?

June 25, 1884. Found a young pear tree almost entirely defoliated by larvæ of *Vanessa antiopa*. I have never heard of the pear as a food plant of this insect.

Aug. 24. I noticed an ichneumon fly (*Ophion*) attempting to deposit eggs in or upon a larva of *Notodonta concinna*. After finding the position of the caterpillar, the *Ophion* brought its head pretty close to it, and then brought its abdomen and ovipositor up under its thorax and between its legs, apparently using its mandibles as a sort of guide or brace for the ovipositor. The *Ophion* was seen to probe the thoracic legs of the caterpillar with its piercer, but for what purpose I could not make out. The caterpillar was very much excited. For want of time I was obliged to give up further observation, and killed the specimens.

Aug. 25, 1884. The Buffalo Tree-hopper (*Ceresa bubalus* Fab.) is very abundant on the branches and trunks of young apple and pear trees, depositing eggs beneath the bark. They are sometimes so numerous as to literally cover the limbs of the trees, and the cutting up of the bark must do considerable injury.

Sept. 22, 1884. Found a larva of *S. drupiferarum* which was infested with parasites, which could be plainly seen just below the skin. An hour after it was taken, I looked at it again, and found nearly all the parasites making holes in the skin, one of them already having its body half through the hole just made. I put the larva in a paper bag and did not look at it again for two days, when I found it still living, but weak, and with circular marks on its back showing where the parasites had made their exit. In the bag I found a bunch of small cocoons, set side by side, on end, like the cells in honeycomb, all being firmly cemented together by a tough brownish substance.

DESCRIPTION OF LARVA OF AGROTIS DECLARATA, Wlk.

BY THE EDITOR.

Several specimens of the larva of this insect were received on the 8th of July, 1884, from Mr. Acton Burrows, Depury Minister of Agriculture, Winnipeg, Manitoba. They were reported as seriously injuring vegetables and field crops in that Province.

Length, one and one half to one and three quarter inches.

Head medium in size, yellowish brown, with a polished surface, dotted and streaked with dark brown.

Form nearly cylindrical, tapering a little towards the head.

Body above dull grayish brown, in some specimens tinged with reddish; skin semi-transparent, showing the movements of the internal organs; cervical shield on second segment similar in color to the head. A pale dorsal line, a subdorsal and a stigmatal line of the same color. Below the stigmata and close to the under surface is a whitish band. On each segment there are a few small shining black dots which are arranged in a single transverse row on third and fourth segments. On the segments behind these there are additional dots forming an imperfect second row, but less regular in their arrangement. On each side of the middle segments, near the spiracles, there is a cluster of two or three of these black dots. No hairs proceed from any of these dots, but there are a few very minute short hairs scattered over the surface of the body, not visible without a magnifying lens. Spiracles oval, black.

Under surface paler and greenish, with whitish streaks, semi-transparent.

One specimen buried itself under the earth soon after they were received; shortly it became a chrysalis, and produced the imago August 23rd. All the others died before completing their transformations. The moth was kindly determined by Mr. John B. Smith, of Brooklyn, N. Y.

EUMACARIA BRUNNEARIA, Packard.

BY D. S. KELLICOTT, BUFFALO, N. Y.

I have recently obtained this elegant Phalenid from its larva, which feeds on the wild red cherry *(Prunus Pennsylvanica)*. July 8, several nearly mature caterpillars were discovered on the twigs of their food-

plant. They were an inch in length : color dull red, closely simulating the bark of the branches ; and to more effectually conceal themselves by mimicry, they hold on, when at rest, by their pro-legs only, the body standing out like a short branch, or they hold to a leaf by their fore legs, making their bodies appear like a petiole.

The hemispherical head is red, with the edges along the fork of the epicranial suture white ; the usual body stripes are represented by very faint, white lines ; there are also faint whitish spots on the sides of the body. The spiracles are nearly round, situated on small black tubercles.

The pupæ formed under the leaves in the feeding cage, without cocoon. They were rather stout, front rounded and smooth ; the last segment ends in a rather long spine with terminal hooklets. The surface of the abdominal rings with small alveoli. Pupa, July 12 ; moth, July 25.

A NEW PAMPHILA.

BY G. H. FRENCH, CARBONDALE, ILL.

Pamphila myus, n sp.

Male.—Expanse .95 of an inch. Upper surface dark olivaceous brown, with a slight vinous reflection, about the same shade as *cernes*, which it much resembles. The primaries have the discal cell and the area in front of the cell like *cernes*, heavily washed with yellow of a little darker shade than that species, the same color extending beyond the cell along the costal area three fourths the distance from the base to the outer margin (as the wings are spread) ; below the cell the same shade of yellow extends along the median vein the same distance, the area below this to the margin rather heavily sprinkled with yellow scales, except the space beyond the lower half of the stigma. This varies but little from the yellow of *cernes*. In *cernes* there is a quadrate sinus of the terminal dark brown of the wing dipping into the yellow beyond the cell, coming up to the cross vein. In this species the sinus is of the same width, but extends inward above the median vein, ending in a point half way to the base of the wing. The stigma is black, narrow, oblique, entire, though constricted below the middle, shorter than in *cernes*, does not reach the submedian below, and the upper end only reaches the second branch of the median, while in *cernes* it passes beyond this veinule, the lower third bent a little

towards the base, in width not more than half as wide as in *cernes;* below the stigma an oblong patch of blackish scales that are bronzy in certain lights. Secondaries sprinkled with yellow scales, the inner half with yellowish hairs that are less olivaceous than in *cernes.*

One specimen has on the primaries, marking what is above described as the outer boundary of the yellow, five small yellow spots that are paler than the yellow along the costa, three in a line back from the costa and two in the median interspaces; and the yellow washing does not quite reach to these spots, there being less yellow also at the base; varying in amount of yellow, as is sometimes seen in different specimens of *cernes.*

Under side of primaries much as above, the yellow orange-tinted, the row of slightly paler spots at the end of the yellow showing more distinctly than above, the apical half of terminal space sprinkled with yellow, the posterior half of wing blackish, the sinus beyond the cell heavily sprinkled over. Secondaries dark brown with the vinous reflection, sprinkled with pale yellow scales, a narrow discal band of small confluent whitish spots marking the outer third, much as in the species of *Amblyscirtes,* not very distinct.

Female.—This lacks the stigma of the male, is marked above much as the female of *cernes,* but is a darker and brighter yellow, the whole area in front of the cell and to the ante-apical spots nearly clear yellow, the rest of the basal two thirds sprinkled with yellow much as in the male. On the under side the obscure band on the secondaries is a little more distinct than in the male.

Body concolorous with the wings above, the thorax with olivaceous hairs, the abdomen sprinkled with yellow; beneath yellowish white, about the shade of *cernes.*

Described from four males and one female taken by H. K. Morrison in Florida.

NOTES ON APATELODES ANGELICA, Grote.

BY J. ALSTON MOFFAT, HAMILTON, ONT.

Being on a visit to Ridgeway in July, 1882, when out one day with Mr. Kilman on a hunt, as I beat a high branch for beetles, a large moth new to me dropped into my umbrella. Having secured it in my poison bottle and remarked that I must now find its mate, another

stroke, and sure enough, I got it. I took a third at that time sitting on the trunk of a tree, which I left with Mr. Kilman. The following season he took one or two, and last spring he found some chrysalids under moss, from which he raised a pair. On visiting Prof. Kellicott, of Buffalo, Mr. Kilman left with him an example, that he might obtain its name. Mr. Kilman now writes to me that Prof. Kellicott has identified it as the *Apatelodes angelica* of Grote's Check List, with *hyalinopunctata* Pack. as a synonym, which latter name would have been more appropriate. Prof. Kellicott conveys the information that it is described and figured in the Proc. of the Ent. Soc. of Phil., iii., 322, plate iv., fig. 1. It is quite a fine moth. Of my pair the female measures 1 7/8 inches in expanse at the apex, and 2 1/8 at the sub-apical angle; the sub-apical is excavate. Edges of wings toothed, color of front wings lavender, with two light brown bands across them, the outer one continued on the hind wing; outside the latter are a row of brown dots on the nervules of the front wings. Near the apex are two transparent spots square in form, the one nearest the costa more than double the size of the one behind it. Color of hind wings light brownish-gray, with a heavy marginal band approaching the color of the front wing; an elevated longitudinal brown stripe in the middle of the thorax.

The male is but 1 3/8 at the apex, and 1 1/8 at the apical angle, in expanse of wing; it is the same in color as the female, but less distinct in its markings.

The attitude of the one I found sitting on the trunk of the tree reminded me very much of *Paonias excaecatus* when at rest. It stood high upon its legs, with its wings slightly spread and its abdomen elevated above their level.

I should mention that Mr. Johnston, of Hamilton, took a specimen in the season of 1881.

HIBERNATION OF COLEOPTERA.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

The condition in which Coleoptera pass the winter is a subject on which there are in American literature but few recorded observations. That no species hibernates in the egg stage is highly probable, though in all the

others it occurs—some wintering in the perfect state alone, some in the larva and the imago condition, and others as larva and pupa.

Many of the species appear to make some preparation, retiring to situations that will more or less protect them from intense cold; others seem to have power to survive without any practical protection, as *Lixus concavus* and *Megilla maculata*, to be mentioned further on.

The majority are apparently subject to conditions that correspond to what is observed in warm blooded animals in a state of complete torpidity, namely: the absence of all detectable respiration; a temperature equal to that of the surrounding atmosphere till near the freezing point, and the power to survive a long entire deprivation of air, and even submersion in carbonic acid gas. There is no well substantiated case, that I have seen, of any of the above class reviving after a few hours submergence in water, except in that of certain swallows washed from their winter quarters in the low banks of streams by freshets; and while some of these appear to have resumed the functions of life partially, none have been resuscitated completely.

Many, if not all Coleoptera in the hiemal state in whatever stage, possess this latter power in an eminent degree, as is very evident from observations on the effects of winter inundations, as in the instance following. In February, 1884, a section of bottom land over one mile in length and one quarter in width, was entirely overflowed by the Allegheny to an average depth of five feet, and remained totally submerged over seven days. This is famous ground for Cicindelidæ and Carabidæ. Thousands of *C. repanda* are on the shore from April till November. *Carabus vinctus*, *Platynus melanarius*, *picipennis*, *extensicollis* and *anchomenoides*; *Pterostichus lucublandus*, *Sayi* and *luctuosus*: *Anisodactylus discoideus*, *Baltimorensis*, &c., &c., abound.

To all appearance no terrestrial life could survive such a protracted submergence, which over a considerable portion of this area was even a week longer; and yet, when the warm days of April came, here was *C. repanda* as numerous as ever: later appeared the various species of Carabidæ, many with the elytra encrusted with mud: and all kinds of insects seemed as abundant as in seasons in which no brumal overflow had occurred.

Lachnosterna futilis, which abounds in grassy places along the bank, was in no wise affected: nor was *Saperda concolor*, which inhabits the canes of a dwarf willow.

In the active state the species mentioned are readily drowned. In some experiments made to determine this point I found that few survived submersion in water for half an hour, and none for over an hour.

The degree of cold that can be endured without death is probably variable according to the species, the more tender retiring on the approach of cold weather deep into the earth, or into substances that are poor conductors of heat, as leaves, moss and decaying wood. Others that can sustain low temperatures without injury seem rather indifferent about the matter, crawling under any covering that happens to be convenient.

Some of the European entomologists by experiments seem to have satisfied themselves that the larvæ of some Lepidoptera may be congealed into masses of ice and fractured as readily as glass, and yet revive and regain their full activity. Though hard to believe, the statement is as worthy of credence as any that depends on human testimony. However, all the observations I have made on Coleoptera and their larvæ go to show the contrary, having never succeeded in reviving any in which there was absolute certainty of the tissues being frozen.

The larvæ of *Urographis fasciatus* and *Dendroides Canadensis*, which live within or just beneath the bark of fallen timber, were examined recently with reference to determining this question. They were found in their shallow excavations, the most of them surrounded by glittering crystals of ice. Nearly all were flexible and the tissues unfrozen, and mostly revived. A few were frozen solid and broke readily, none of these giving evidence of life.

A large number of the larvæ of *Dectes spinosus*, inhabiting the stems of *Ambrosia artemisifolia* (rag-weed) at or just below the surface of the ground, were taken out of their quarters. In many instances the stems had been filled with water and the larvæ were enclosed in cylinders of ice. The greater number were flexible and mostly regained activity on a rise of temperature; such, however, as were evidently congealed could not be resuscitated.

In the torpid condition some species of Coleoptera certainly have the power of sustaining vitality while exposed for a long time to a temperature below, or but little above the 0 of Fahr. The first week of this month (February) I found a large collection of *Megilla maculata* in a field, near a tree; they had congregated on the ground under and around a small piece of shingle that did not cover the half of them, and were massed together on top of one another to a considerable depth—all apparently

dead. Several were examined when found, and about one third of these proved to be entirely congealed, the remainder being flexible and showing signs of life when enclosed in the hand for a short time. The temperature to which these had been exposed was several degrees below zero, and for a couple of weeks scarcely ever more than 16 degrees above. Such collections of this species are not uncommon. I gathered up the full of a half ounce collecting bottle, leaving fully as many behind. In the warmth of my office, in a couple of days, about one half of those collected became active, though none that I regarded as frozen ever gave evidence of the slightest vitality.

During the very cold weather of last winter I found five specimens of *Lixus concavus* embedded near one another in ice in a patch of *Rumex* on low ground. A couple taken out without thawing appeared to be dead; sections were made in these in different directions with a sharp knife without detecting any frozen tissue, or any frost in the cavities of the bodies. The others were allowed to thaw out gradually and then they were discovered to be alive. Their after history is somewhat curious.

The tenacity of life possessed by this species has often been the subject of remark, and appears, from the following, to be greatly intensified by the mysterious changes that accompany the condition of torpidity. These three were thrown into strong alcohol, and on the third day were taken out and pinned, the time they were in it being over sixty hours. Five days afterwards they were observed to be alive and wriggling, their limbs quite lively; then they were pinned to the inner end of the cork stopper of a bottle containing cyanide of potassium, and when examined four days afterwards appeared to be as lively as when first pinned. How long afterwards they lived is unknown, as a long interval occurred before the next observation, and then they were truly dead.

By the foregoing it must not be inferred that I maintain the freezing of the tissues of torpid Coleoptera to be incompatible with the resumption of the functions of life—an opinion that would be, to say the least, presumptuous in the face of the many opposite experiments and observations by distinguished men.

The subject is one full of mystery and deserves the most careful attention.

CORRESPONDENCE.

XYLORYCTES SATYRUS AND STRATEGUS ANTAEUS.

Dear Sir: It must be assumed that Dr. H. A. Hagen was caught napping when he penned the note published in the CAN. ENTOM., Dec., 1884, vol. xvi., p. 239-240, for otherwise, with his predilection for the "literature" of entomology, he would not have failed to note that the capture of *Xyloryctes satyrus* north of Pennsylvania had been several times recorded. Presumably the reference to that species in the Am. Entom., Nov., 1868, vol. i, p. 60, was to specimens taken on Long Island, N. Y. This species is included in Mr. J. Pettit's "List of Coleoptera taken at Grimsby, Ont.," (CAN. ENTOM., April, 1870, vol. ii., p. 86), and in Mr. W. H. Harrington's "List of Ottawa Coleoptera," (Trans. Ottawa Field Nat. Club, 1883-4, vol. ii., No. 1, p. 80), and further, Mr. John Hamilton (CAN. ENTOM., June, 1884, vol. xvi., p. 107), writes of this species: "This large beetle is widely distributed, being found in Arizona, New Mexico, Texas, Kansas to Canada, and southward, and probably occurring wherever the ash and liquidambar grow." My mention, in 1884, of *X. satyrus* and *Strategus antaeus*, in the chapter "Coleoptera," of vol. ii., of Cassino's Standard Natural History, might readily be overlooked, since that work is of a somewhat popular nature. I there wrote, p. 370, "*S. antaeus* . . . . is found near the Atlantic coast of the United States as far north as Massachusetts. . . . . *X. satyrus* is found in the same regions as is *Strategus antaeus*." These statements were based upon specimens in my own small collection, which includes ten specimens of *X. satyrus*, from localities north of Pennsylvania. These localities are Cambridge, Springfield and Amherst, Mass.; Suffield, Conn.; and Montauk Point (the extreme eastern end of Long Island), N. Y. I have seen specimens of this species in abundance on the sidewalks of Sag Harbor, eastern Long Island, and will take care that even a Cambridge representative of the species is deposited in the entomological collection of the Museum of Comparative Zoology, of which Dr. Hagen takes such excellent care. Of *Strategus antaeus*, my collection has only a small series, as follows: Several specimens from Springfield, Mass., one from Michigan, and one from Cumberland Gap, Kentucky.

GEORGE DIMMOCK.

Cambridge, Mass., 16 Feb., 1885.

Dear Sir: I was particularly interested by Dr. Horn's remarks on *labyrinthica* or *pnirsa* in his notes on *Chrysomela* in a recent number of the Can. Ent. When on the 23rd of May, 1881, I captured my first specimen on the wing, I regarded it with great satisfaction. The pure white of a fresh specimen contrasted with the glossy greenish black of its peculiar markings, makes it an exceedingly attractive object to the eye when first seen. I secured thirteen that season. Being eager to obtain its name, I sent specimens where I thought it likely to be got; they in turn applied to others, and then informed me, to my no small disappointment, that it was *multiguttis*. We find it restricted here exclusively to one locality, and that not extensive. In 1882 I searched carefully for it, and secured nineteen. On one occasion I found one paired with a *scalaris*, but *scalaris* is rarely met with there. In 1883 I took over eighty *pnirsa* without any special effort, and did not see half a dozen *scalaris* that season in that locality. My first capture of *pnirsa* in 1883 is dated 12th June; on the 16th I took nineteen, on the 21st, twenty-one. The last noted is the 9th July, but they were seen after that. Being from home during their season in 1884, I saw nothing of them, but was informed they were quite scarce. I have inferred that it cannot be a very abundant form from the fact that when it was sent to collectors in Buffalo and New York who have extensive collections and much experience in exchange, it was unknown to them. I find it very liable to discolor when drying, the white becoming rusty, which detracts much from the beauty of its appearance.

J. Alston Moffat, Hamilton, Ont.

Dear Sir: In reply to the question of Dr. Hagen (Can. Ent., v. 16, p. 239–240) concerning the distribution of *Xyloryctes satyrus*, it may be of interest to note that the species has been recorded from various parts of Canada by Bell, D'Urban, Hamilton, Harrington, Pettit, Reed, Ritchie and Saunders; from Mass. by Harris (specimens from Martha's Vineyard and New York are in his collection); from Long Island, N. Y., and Illinois, by Walsh; near Buffalo, N. Y. (Lesch & Reinecke); near Cincinnati, Ohio (Dury); Lower Michigan (Hubbard & Schwarz); Davenport, Iowa (Putnam); Keutucky (Siewers); Texas, Kansas, Neb., Ariz. (LeConte); N. Mex. (Hamilton); Eastern, Middle and Western States (Ulke). I have collected it in Western Massachusetts and Rhode Island, and have specimens from Pa., Md., Wisc. and Mich.

Saml. Henshaw, Boston, Mass.

The Canadian Entomologist.

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PREPARATORY STAGES OF ICTHYURA PALLA, FRENCH. WITH NOTES ON THE SPECIES.

BY G. H. FRENCH, CARBONDALE, ILL.

EGG.—Globular, a little flattened at base, smooth; color orange yellow. Duration of this period, 24 days.

Young Larva.—Length .08 of an inch. Color pale brownish green. Head and a small cervical shield jet black. Each segment has about six blackish tubercles from which arise rather long gray hairs, the dorsal tubercles on segments 5 and 12 a little more prominent than the others. Duration of this period, 3 days.

After First Moult.—Length .14 of an inch. Color pale yellowish green. Head black, as also a plate and a small spot on the top of the second segment. To each segment six purplish black slightly tubercular spots; those on the dorsum faint except those on 5 and 12, which are prominent, each pair confluent; a few hairs from each spot. Thoracic feet black. Duration of this period, 4 days.

After Second Moult.—Length .25 of an inch. Color green, with a yellowish tint; head and thoracic feet jet black, the spot on the middle of the second segment and the plate black, but slightly purple tinted; the rest of the markings dark reddish purple. These consist of a dorsal line, with a very faint line each side; a more prominent subdorsal line, with a line each side composed of elongate spots, the breaks being at the ends of the segments, each spot a little broader in the middle than at the ends. The upper of these bordering line of spots contains the posterior dorsal piliferous spots, the anterior of each joint being in the line bordering the dorsal line. The line below the subdorsal contains the row of suprastigmatal piliferous spots. There is a faint stigmatal line with some mottlings below. Segments 5 and 12 slightly elevated, the anterior pair of spots closer together and colored; a spot on each abdominal leg. Duration of this period, 4 days.

After Third Moult.—Length .40 of an inch. The stripes remain the same as during the preceding period. The ground color of the dorsum

is bright yellow, reaching to the line containing the outer row of dorsal piliferous spots; below this line to the line below the subdorsal, pale whitish; below this the color is yellow. Duration of this period, 4 days.

After Fourth Moult.—Length .55 of an inch. The plan of color and markings unchanged save that the subdorsal color is grayish white, the elevations on joints 5 and 12 more prominent, and in same the dorsal yellow brighter.

After Fifth Moult.—Length 1 inch. Similar to the preceding stage, but varying a little in color. Dorsum clear yellow with three dark reddish purple stripes; below this grayish yellow, the two broadest of the three lines mottled, the upper one the most; below this, including the stigmatal line and the substigmatal space, reddish yellow; the stigmatal line red, much broken; venter concolorous with the substigmatal space. Thoracic feet, head and two spots on the neck jet black; joints 5 and 12 have each two prominent velvety black papillæ; a white hair from each piliferous spot, and in addition to this a fine short white pubescence covers the whole body, but not so thickly as to obscure the color.

Mature Larva.—Length from 1.10 to 1.20 inches; width of head .15 of an inch, of body .20. Dorsum lemon yellow with three purplish black stripes arranged as in preceding stages. Just above the stigmata is a narrow yellow line; between this and the yellow of the dorsum the ground color is gray, in some examples tinged with yellow on segments 2 to 5, in others it is a paler yellow; in the centre of this space is a purplish black line, and on both borders or edges of the space is a mottled stripe of the same hue. The stigmatal, substigmatal and ventral spaces, with the prolegs, somewhat carneous, the slight fleshy ridge below the stigmata being most so. In the upper part of the stigmatal space is a mottled line, the stigmata black. Head, thoracic feet and spots as at the first of the period. In some examples the stripes are more of a dark purplish red than black. Duration of this period from 4 to 7 days.

Chrysalis.—Length .55 of an inch; cylindrical; depth through thorax and the first abdominal segment .18 of an inch; through joint 3, .20; joint 4, .21; joint 5, .21; from here tapering gradually to the end, which is rounded, smooth, ending in a stylus with a hook at the end on each side. Surface smooth, shining, a few punctures between the joints, and the upper part of head and thorax a little roughened. Color dark chestnut brown, the eyes and a little shading at the end of the wing cases darker. Wing

cases extending back to posterior part of joint 5, leg and antennæ cases not so far. Duration of this period from 10 to 13 days.

For several years the larvæ of this species have been taken from the willows here, when nearly full grown, in September, and the moths obtained from them in the spring, but not till last spring (1884) did I succeed in taking the larvæ through all their stages. In 1883 eggs were obtained in large numbers, but they did not hatch, not for lack of being fertilized, because the larva developed inside the eggs to near the time for hatching, as could be seen through the shell. Two or three of them even came out, but in so weak a condition that they did not eat. I think they must have been affected by the disease that seemed to affect all Lepidopteral life that year.

These eggs were obtained May 11th, and the imagines were produced from July 7 to 13. There are two broods in a season, the larvæ feeding on willows *(Salix nigra)*, the last brood hibernating in the pupa state. In feeding they fasten the leaves of the ends of a twig together and feed in this larvarium, usually several feeding together. They do not pupate in this, but in the breeding cage spin close cocoons of brown silk in the corners of the box.

As a species this stands close to *inclusa*. There are several points of difference that seem to be permanent. It is of smaller size, out of a large series of reared and captured specimens none of the females being as large as all my females of *inclusa*, the most of them smaller than the males of that species; the males being proportionally smaller than the males of *inclusa*. In color the females are lighter than the *inclusa* females, the oblique transverse shades more brown tinted and less orange tinted; the ante-apical orange that in *inclusa* is a distinct patch across four or five subcostal interspaces separated by the veins, is in *palla* a mere stain, in no examples a defined patch, and in some scarcely distinguishable. The males average darker than the males of *inclusa*, both fore and hind wings being more of a brown of the vandyke-brown order, rather than umber, being more the shade of the male of *indentata*. In this sex the ante-apical orange is more distinct than in the female, but in about nine examples out of ten is still a stain instead of a patch, occasionally one showing about two very small spots that are fairly outlined.

Palla seems to be the species distributed over this portion of the United States. I found larvæ in Nebraska in 1882 that produced this species, and have had a number of specimens sent me from Central

Illinois, but have never seen *inclusa* in this region, though I have looked carefully for the larvæ in both willow and poplar for several years. If *palla* breeds as true to type in all localities where found as it does here, we shall have to regard it as a good species.

PROBABLE ORIGIN OF THE WORD BUTTERFLY.

BY FREDERICK CLARKSON, NEW YORK CITY.

The transformation of a grovelling worm to the glory that attaches to the winged aspirant of the heavens, has won for this insect from remote antiquity the appellation of Spirit or Soul, as typical of the resurrected human body. There is, I think, good reason to believe that the root meaning of the word Butterfly dates back to early Egyptian history, and as a hieroglyphic it is synonymous as representing the qualities of completeness and perfection which characterize the soul. I have supposed that it might serve the interest of this journal to record such historical gleanings bearing upon this subject as have come within my reach. It is said that in Yorkshire in England, the country folk call the night-flying white moths, Souls. This restricted application of the term very forcibly expresses what had been traditionally received by these people, and which they unwittingly have applied to certain white winged species. The English word Moth is said to be the Egyptian MUT or MAT. MAT is to pass; MUT to die; MATT, unfold, unwind, open, as the chrysalis entered the winged state and passed. The winged thing was a symbol of the Soul; it appears in the hieroglyphics as the Moth or Butterfly. The common view, we know, originates the word with the yellow Diurnae as illustrated in the butter-colored wings of the genus *Colias*. The word Butter is supposed to be derived from PUT (Eg.), food; and TER (Eg), made, fabricated. The Butterfly may be the type PUT (Eg.), TER, complete, perfect. Thus in death (MUT) the Soul passed, unfolded like the Moth, whose chrysalis showed and was the type of the process, whence the Butterfly. Calling the Moth a Soul identifies the imagery as Egyptian. In Cornwall, in England, departed souls, moths and fairies are called Piskeys. Piskey is the same word as Psyche, and both are derived from the Egyptian, in which KHE is the soul, and SU is she; hence the fem-

inine nature of the Greek P-SU-KHE. Without the article, SAKHU is the understanding, the illuminator, the eye, and soul of being, that which inspires.

The ancients evidently were not very good Entomologists, for this original meaning, beautiful as it is, is altogether incompatible with the teachings of the modern science, for in these days we realize that the so-called spiritual life, as represented by the butterfly, is but a span in comparison with the earthly life, as illustrated by the larva, and that the heavenly aspiration and grace which mark the shorter life are the outcome of a comparative eternity of rioting and waste; yet, be it said, the silk worm at the eleventh hour makes a good record.

"Well were it for the world, if all
Who creep about this earthly ball,
Though shorter-lived than most he be,
Were useful in their kind as he."

Moreover, who that has ever attempted to capture a *Limenitis arthemis*, but has learned to his cost, that though a thing of beauty, and its possession a joy forever, its habits are deceitful. Well do I remember a chase for this butterfly - the first that I had ever seen on the wing. It was a royal game of tag, with hide-and-go-seek variations. We see-sawed up and down a ravine for nearly an hour. When first discovered it was regaling itself in the sunlight, upon a leaf about half way down the opposite bank, all the while jerking its wings, after a fashion, as if beckoning me over. By the time I had worked my way down over the rocks and through the briers, it was spreading its wings on the bank I had just left, and when I returned it was away again to its favorite leaf on the other side. Tired and heated, I gave up the chase, when the *arthemis*, in a most provoking way, lit upon a shrub beneath my very nose. This coquettish insect apparently realized my discomfiture, and after repeated approaches and withdrawals, it rose on wing, and with

"The light coquettes in sylphs aloft repair
And sport and flutter in the fields of air."

SHORT NOTES ON COLEOPTERA.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Hololepta fossularis Say. The habitatio of this insect is usually under locust bark in the first stages of decay, a fact so well known that collectors

would look for it in no other place. But last summer I found a number of them under the bark of *Ulmus fulva* (slippery elm), the odor of which in the same state of decomposition is as rank as that of *Robinia*. With them were several *H. lucida*. The individuals of these two species so approximate as in some examples to be scarcely separable; and indeed there is a reasonable doubt whether any of them are instinctively conscious of being specifically different.

Ips fasciatus Oliv. This well known species is very variable in size, color and sculpture. Several of these color variations have been described as species, as: *4-guttatus* Fab., *4-signatus* Say, *bipustulatus* Mels., *6-pustulatus* Reitter. *Quadriguttatus* Fab. is the European form, and though described subsequently to *fasciatus* Oliv., is still retained in the European catalogues, as the form *fasciatus* does not occur there, as I am informed.

The form *fasciatus* is the most common here, and is that into which all the others are resolved; in it the elytra are black with an irregular broad basal, and a sub-apical fascia, yellow; individuals are met with totally black without any spot; others have only a small basal and sub-apical spot yellow (more often reddish); others add to these a humeral lunule; others have various other spots, and by the gradual dilation and coalescing of these through a series of specimens, the full form *fasciatus* is reached, which can be readily verified by any one who takes the trouble.

The point I wish to present is the seasonal character of the melanism. I have never met with these black and spotted forms at any other time than in early spring, usually during April, at the sap of trees, especially birch and maple. As the season advances these entirely disappear, and the fasciate form alone remains, continuing till autumn. Some of these probably hibernate (though this is not established by observation), and appear in the spring among the recently developed melanotic variations. Whether the fasciate form decreases northwardly and increases southwardly has not been ascertained, but two specimens from Mt. Washington and two from Montana are of the form *4-guttatus*. As the species in the north extends across the continent, northern collectors might easily determine the matter. This insect is often found in the green ears of maize; but only in such as have been injured by birds or animals, which scarcely entitles it to be classed among the injurious.

Gaurotes abdominalis Bland. This graceful Longicorn occurs from Massachusetts to Western Virginia, but in restricted localities, which accounts for its being met with by so few collectors. It usually affects

wild places along streams that flow between rugged hills and mountains. Here it appears early in May on the blossoms of the wild plum, and a little later in more abundance on various species of Cornus (*C. circinata*, *C. paniculata* and *C. alternifolia*), popularly known as swamp dog-wood, though the species mentioned do not usually grow on wet ground. It is also fond of laurel blossoms (*Kalmia latifolia* and *K. angustifolia*). I have never observed it later than the first week in June. It is exceedingly wary and active, not being easily taken by beating. After a sudden noonday shower I took over twenty specimens, by hand, from a low Cornus bush, into the cymes of which they had crawled for protection.

It greatly resembles *G. cyanipennis*, and like it, varies in color from bright green to copper and golden; but is always to be known by its rufous abdomen. The structural differences, notwithstanding the close similarity, are so great that eventually the two species may be placed in different genera. See Bulletin of Brooklyn Ent. Soc. v. 7, p. 107.

Saperda discoidea Fab. According to all the observations on record that I have seen, the larva of this beetle lives under the bark of diseased or deadened hickory and walnut, and before transforming penetrates the solid wood and there undergoes its changes. My own observations are not in accord with this. I once took from the thick bark of a hickory log in some cordwood, four mature individuals, the larvæ of which had fed partly on the bark and partly on the wood, and when approaching maturity had entered the bark and there disclosed. The past year, I found in May more than twenty of the full fed larvæ, pupæ, and beetles yet immature, in the bark of a large standing hickory that had been deadened about two years previously; they were all on the north side of the tree and none over fifteen inches from the ground. After feeding on the outer layers of wood till they had nearly attained their full growth, the larvæ had bored, instead of the wood, into the thick bark, closing their burrows in the usual way, and there transforming like the species of *Urographis* do in oak bark.

Where the larva selects the wood it may be legitimately inferred that the bark is not thick enough for its purposes. But how does it know whether the bark is thick or thin? This instinctive versatility in adapting itself to circumstances is only another of the mysterious things that meet the investigator of Nature at almost every step.

Dioedus punctatus Lec. is abundant here from April to September. It inhabits decaying oak (mostly of the red and chestnut species) that is

almost changed to humus. It is found in all its stages at the same time, and seems to have no other business than to hasten the destruction of its habitation. I have never met with a specimen elsewhere. Heretofore its habitatio has been given as under the bark of yellow pine.

Scolytus rugulosus Ratz. I have obtained this insect twice from hickory twigs placed in a box. The color of these is black, like *S. 4-spinosus* I have others that are reddish-brown, said to be from peach trees. I have carefully looked for it several times in diseased trees of the last mentioned species, and also in pear trees affected by blight, but always with negative results.

Macrobasis unicolor Kirby is found here in countless numbers from the middle of July till the middle of August, on a leguminous plant *(Baptisia australis)* growing abundantly on the river shore, the foliage of which it eats with great avidity and entirely destroys. In Economic Entomology it is classed among the insects injurious to vegetation, according to Riley in the Missouri Reports, devouring potato vines, beans, the foliage of the apple and the honey locust; and on Mount Washington was found by Mr. F. Gardiner, jr., on *Pyrus americana.* Here it has not been observed to have such tastes, nor to eat any other than the plant mentioned, though potatoes, beans, &c., are cultivated very extensively close by.

From the observations of Mr. Riley as given in his paper, "On the Larval Characters and Habits of the Blister-beetles," &c., it is probable the young of this beetle live on the eggs of *Caloptenus femur-rubrum*, which is also very abundant on the river shore. The gray race is the only one occurring here, and fortunate is it for the farmers along the river that the insect prefers a useless weed to his beans and potatoes. I have experimented with them, and find they possess vesicatory properties equal to the imported *C. vesicatoria*, a fact, however, that is not new.

In the larval state of Coleoptera many live in decaying bark and wood, some confined to a single species, or the species of a genus and perhaps its allies. Hickory and beech are more palatable to a greater number than any other wood. The following seem to be omnivorous :—

Cucujus clavipes feeds on locust, maple, sycamore, wild cherry, hickory, white oak, elm ; *Clinidium sculptile* on spruce, hemlock, tamarack, black oak, hickory, chestnut, ash, gum, poplar, birch ; *Synchroa punctata* on all species of oak, hickory, apple, cherry, mulberry, osage orange, chestnut ; *Dendroides canadensis* on nearly everything.

LIST OF STAPHYLINIDÆ TAKEN AT BELLEVILLE, ONT.

BY PROF. J. T. BELL, SC. D.

Falagria dissecta.
" venustula.
Homalota—10 species not yet determined.
Aleochara lata.
" brachypterus.
" bimaculata.
Oxypoda sagulata.
Myllæna dubia.
Cilea silphoides.
Erchomus ventriculus.
Tachinus pallipes.
" fimbriatus.
Tachyporus brunneus.
" elegans.
Conosoma crassum.
Bolitobius cinticollis.
" dimidiatus.
" anticus.
Bryoporus rufescens.
Mycetoporus lepidus.
" americanus.
" flavicollis.
Heterothops fumigatus.
Creophilus maxillosus.
Leistotrophus cingulatus.
Staphylinus vulpinus.
" fossator.
" badipes.
" cinnamopterus.
" violaceus.
Ocypus ater.
Philonthus cyanipennis.
" æneus.
" palliatus.
" micans.
Xantholinus cephalus.
" obsidianus.
" obscurus.
Leptacinus flavipes.
Diochus Schaumii.
Lathrobium grande.
" punctulatum.
" simile.
" nigrum.
" tenue.
" collare.
" othioides.
" debile.
Cryptobium bicolor.
Stilicus biarmatus.
Lithocharis obsoleta.
Sunius binotatus.
" longiusculus.
Pæderus littorarius.
Dianous cœrulescens.
Stenus juno.
" 8 species undetermined.
Euæsthetus americanus.
Bledius semiferrugineus.
" emarginatus.
Oxytelus rugosus.
Trogophlœus 4-punctatus.
Olophrum obtectum.

Omalium rufipes.
Protinus atomarius.
Micropeplus tesserula.
Pycnoglypta lurida.
" convexa.
And about 6 species not yet identified.

A NEW TENTHREDINID.

BY L. PROVANCHER, CAP ROUGE, QUEBEC.

Genus *Synairema*, Hartig.

This genus was detached from *Tenthredo* by Hartig in 1837, for an insect described in 1793 by Panzer, under the name of *Tenthredo rubi*, found in Germany, Sweden, France, Tyrol, &c. In 1849, Bremi described a new species found in Helvetia, which he named *S. alpina*. It has not yet been recorded as met with in America.

Synairema differs only from *Tenthredo* by its lanceolate cell, which is largely contracted in the middle, while in the last it is separated by a straight nervule.

Synairema Americana, nov. sp.

♀.—Length .46 inch. Black; face below the antennæ, inner orbital lines reaching the occiput and thence curving inwards, mandibles, clypeus, palpi, genæ, scape underside, a spot on each side of the median lobe of mesothorax, a spot on tegulæ, scutel, a point before and another one behind, apex of basal plates, pleura and pectus in parts, white. Antennæ long, slender, black with a white spot on the scape underneath. Wings hyaline, nervures and stigma brown black. Legs white, including coxæ and trochanters, the two anterior pairs with a black line exteriorly on their femora, tibiæ and tarsi; the posterior pair black, with coxæ, except a black spot outside, trochanters and basal third of femora, white; the spines of their tibiæ, except the tips, and a ring at the base of the first joint of the tarsus, also white. Abdomen elongated, black, shining, venter more or less whitish on the sides. Valves of the terebra black, shortly exserted.

Captured one female at Cap Rouge.

LIST OF DIPTERA TAKEN IN THE VICINITY OF PHILADELPHIA FROM 1882 TO 1884, INCLUSIVE.

BY E. L. KEEN, PHILADELPHIA, PA.

The object of giving this list in its present imperfect form is to call the attention of our Entomologists to this greatly neglected order of insects, and as most of the families are still in an unworked condition, to call especial attention to them; of course, the named species represent only about one fourth of all the species taken by me during my three years collecting, and were mostly taken in Fairmount Park, and a few at Delanco, N. J.

If a few of our many Entomologists would turn their attention to the Diptera, they would be sure to find an interesting and very wide field, in fact there would be room enough for nearly a dozen systematic workers in this order.

At present the Diptera are receiving great attention from Dr. S. W. Williston, who has already greatly advanced the study of the order, and if we had a few more such workers, the Diptera would soon rise to as honorable a rank as is held by Coleoptera, etc.

Cecidomyidæ.

Took a few species, but none are determined.

Mycetophilidæ.

Species undetermined.

Simulidæ.

Simulium venustum (?) Say.

Bibionidæ.

Bibio albipennis, Say.
" femoratus, Wied.
Bibio articulatus, Say.
Scatopse atrata, Say.
And several undetermined species.

Culicidæ.

Culex ciliatus, Fabr.
" taeniorhynchus, Wied.
Anopheles quadrimaculatus, Say.
Several other species were taken, but are undetermined.

Chironomidæ.

There are a large number of species of this family, but they are not worked up.

Psychodidæ.

Took six species of this family on the bark of trees last summer; there are only two recorded in Osten Sacken's Catalogue.

Tipulidæ.

Geranomyia canadensis, Westw.
" rostrata, Say.
Rhypholophus nubilis, O. S.
Erioptera straminea, O. S.
" venusta, O. S.
Chionea valga, Har.
Symplecta punctipennis, Meig.
Epiphragma fascipennis, Say.
Limnophila montana, O. S.
Eriocera fuliginosa, O. S.
" spinosa, O. S.
Amalopis inconstans, O. S.
Bittacomorpha clavipes, Fabr.
Tipula abdominalis, Say.
" bella, Loew.
" costalis, Say.
" cunctans, Say.
" fasciata, Loew.
" fuliginosa, Say.
" hebes, Loew.
" infuscata, Loew.
" tricolor, Fabr.
Pachyrhina collaris, Say.

Besides the above there are quite a number of undetermined species.

Rhyphidæ.

Rhyphus alternatus, Say.
Rhyphus punctatus, Meig.

Stratiomyidæ.

Metoponia fuscitarsis, Say.
Beris viridis, Say.
Clitellaria subulata, Loew.
Stratiomyia marginalis, Loew.
Sargus decorus, Say.
" elegans, Loew.
Chloromyia viridis, Say.
Stratiomyia norma, Wied.

Also a number of undetermined species.

Tabanidæ.

Chrysops callidus, O. S.
" celer, O. S.
" excitans, Walk.
" flavidus, Wied.
" frigidus, O. S.
" fugax, O. S.
" niger, Macq.
" obsoletus, Wied.
" plangens, Wied.
" univittatus, Macq.
Chrysops vittatus, Wied.
Therioplectes lasiopthalmus, Macq.
Tabanus atratus, Fabr.
" costalis, Wied.
" lineola, Fabr.
" nigrovittatus, Macq.
" stygius, Say.
" sulcifrons, Macq.
" trimaculatus, Palisot-Beau.

Leptidæ.

Chrysopila ornata, Say.
" propinqua, Walk.
" quadrata, Say.
Chrysopila thoracica, Fabr.
Leptis punctipennis, Say.

Took quite a number of undetermined species of this family.

Asilidæ.

Leptogaster flavipes, Loew.
Stichopogon trifasciatus, Say.
Holcocephala abdominalis, Say.
" calva, Loew.
Deromyia discolor, Loew.
" umbrinus, Loew.
Atomosia glabrata, Say.
" puella, Wied.
Cerotainia macrocera, Say.
Dasyllis flavicollis, Say.
" thoracica, Fabr.
" tergissa, Say.
Pogonosoma dorsata, Say.
Laphria sericea, Say.
Mallophora laphroides, Wied.
" orcina, Wied.
Promachus Bastardii, Macq.
" quadratus, Wied.
Erax aestuans, Linn.
" Bastardi, Macq.
" lateralis, Macq.
" furax, Will.
Proctacanthus brevipennis, Wied.
" Philadelphicus, Macq.
Asilus Novæ Scotiæ, Macq.
" sericeus, Say.

Midaidæ.

Midas clavatus, Drury.

Bombylidæ.

Exoprosopa fascipennis, Say.
Anthrax alternata, Say.
" fulvohirta, Wied.
" lateralis, Say.
" sinuosa, Wied.
Argyramoeba limatulus, Say.
" Œdipus, Fabr.
" Simson, Fabr.
Bombylius fratellus, Wied.
" pulchellus, Loew.
" validus, Loew.
" varius, Fabr.
Sparnopolius fulvus, Wied.
Geron calvus, Loew.
Systropus macer, Loew.

Therevidæ.

Have quite a number of species, but none are determined.

Scenopinidæ.

Scenopinus fenestralis, Linn.

Empidæ.

Species of this family are quite plentiful around Philada., but I have none named.

Dolichopodidæ.

A large number of species are found here of this large family; only a few of mine are determined.

Dolichopus batillifer, Loew.
" bifractus, Loew.
" eudactylus, Loew.
Diaphorus spectabilis, Loew.
Scellus exustus, Walk.
Psilopus patibulatus, Say.
" sipho, Say.

Syrphidæ.

(See Vol. xvi., No. 8, pp. 145-147.)

Conopidæ.

Conops tibialis, Say.
Stylogaster neglecta, Will.

Have quite a number of undetermined species.

Pipunculidæ.

Took two or three species of this family, which are not as yet determined.

Tachinidæ.

Took about 50 species of this large family, of which the following are determined:—

Trichopoda pennipes, Fabr.
Exorista flavicauda (?) Riley.
Hystricia vivida, Harr.
Belvoisia bifasciata, Fabr.

Of *Dexidæ*, *Sarcophagidæ*, *Muscidæ*, *Anthomyidæ*, I took a very large amount, but for the most part the species are unnamed.

Cordyluridæ.

Cordylura bimaculata, Loew.
" setosa, Loew.
Scatophaga stercoraria, Linn.

Helomyzidæ.

Helomyza quinquepunctata, Say.

Sciomyzidæ.

Tetanocera arcuata, Loew.
" pictipes, Loew.
" plebeja, Loew.
Tetanocera saratogensis, Fitch.
Sepedon armipes, Loew.
" fuscipennis, Loew.

Psilidæ.

Loxocera cylindrica, Say.

Micropezidæ.

Calobata antennipennis, Say.

Ortalidæ.

Pyrgota undata, Wied.
Rivellia viridulans, R. Desv.
Callopistria annulipes, Macq.
Seoptera colon, Loew.

Camptoneura picta, Fabr. Chætopsis aenea, Wied.
Stictocephala vau, Say.

Trypetidæ.

Straussia longipennis, Wied. Euaresta bella, Loew.
Oedaspis polita, Loew. " festiva, Loew.
Eurosta solidaginis, Fitch.

Lonchæidæ.

Palloptera superba, Loew.

Sapromyzidæ.

Sapromyza compedita, Loew. Sapromyza philadelphica, Macq.

Diopsidæ.

Sphyracephala brevicornis, Say.

Ephydridæ.

Paralimna appendiculata, Loew.
Ochthera mantis, Deg. Also several other species.
Ephydra atrovirens, Loew.

Oscinidæ.

A few species around decayed fruits.

NORTH AMERICAN PYRALIDÆ.

BY PROF. C. H. FERNALD, STATE COLLEGE, ORONO, ME.

Crambus zeellus, n. s.

Expanse of wings, from 18 to 24 m. m.

Palpi, head and thorax, pale leaden gray. The labial palpi extend forward as far as the length of the head and thorax. The maxillary palpi are as long as the head.

Fore wings dull leaden gray, mixed with ashy and whitish, especially on the outer part, and crossed beyond the middle by two angulated dull ochre yellow lines, overlaid more or less with dark brown. The first line crosses the end of the cell where it is angulated. The second crosses the wing about half way between this last and the end. The terminal line is dark brown, and a dark brownish cloud extends obliquely in from the apex to the second line, but does not reach the costa. A narrow ochre yellow line, somewhat curved, extends from the middle of the base of the wing to the second line near the anal angle, and a similar line, though less

plainly marked, runs parallel, between this line and the hinder margin. The terminal space is more or less gray. The outer margin is regularly excavated below the apex. Fringes pale metallic lead color. Hind wings pale fuscous with lighter fringes. Under side of the body and all the wings pale fuscous.

Habitat.—Me., Penn., W. Va., Ill., Mo.

Bred from corn by Prof. S. A. Forbes.

I am under obligations to Lord Walsingham for comparing specimens of this and other species with the collections in London.

Crambus hulstellus, n. s.

Expanse of wings, 26 m. m.

Head, thorax and fore wings, chalky white. The palpi are somewhat fuscous on the outside, but white on the rest of their surface. Antennæ fuscous.

The fore wings are crossed by a twice angulated, brown, median line, much darker and heavier on the angles. This line starts from a point a little beyond the middle of the costa and runs out beyond the end of the cell where the first acute angle is formed. From this angle the line runs obliquely across the wing to the middle of the hinder margin forming the second angle just below the cell, beyond which the line is nearly obsolete. A double, yellowish line starts from the costa a little beyond the outer fourth, and curving downward runs nearly parallel with the outer margin, to the hinder margin a little within the anal angle. The terminal space is yellowish and this color fuses with the line so that it does not appear double except at the costa, and there is a row of seven black points along the outer margin. The space between the median and subterminal lines has six longitudinal, geminate brown dashes on the veins. The surface of the wing inside of the angles of the median line is covered with silver colored scales, and there are three dark brown dashes, one near the base above the hinder margin, the second outside of this and a little above, and the third extends along towards the second angle of the median line ; and the costa is more or less sordid. Cilia white with a silvery base which is broken by the white opposite the second and third black spots below the apex.

The hind wings are sordid white, with a narrow terminal border slightly darker. Cilia pure white. Under side of the hind wings lighter

than above, under side of fore wings sordid white, with the subterminal line and terminal black points reproduced.

Received from Texas by Rev. Geo. D. Hulst, for whom I take great pleasure in naming this species.

Eurycreon perplexalis, n. s.

Expanse of wings, 22 m. m.

Palpi and head mouse-colored. The base of the palpi beneath and a superciliary line, white. Thorax and fore wings pale mouse-colored, the latter overlaid more or less with whitish scales. The space between the reniform and oblique orbicular is whitish. The inner line is obsolete; the outer line starts at right angles from the costa, has a re-entrant angle outside of the upper part of the reniform spot, thence it is outwardly rounded and dentate with five teeth, down to vein two, where it sends a long blunt angle in towards the base of the wing, then turns and forms a similar but shorter outward angle, then runs to the hinder margin at right angles with it. This line is bordered on the outside with a narrow whitish shade, most prominent on the costa and before the hinder margin. The terminal line is dark and composed of confluent semi-lunate spots. The fringes are paler than the wings.

Hind wings pale gray, darker terminally, with the faintest indication of an extra median line. Fringes paler with a basal darker line. Under side of all the wings pale yellowish fuscous, with the markings of the upper surface faintly indicated.

Received from Texas by Rev. Geo. D. Hulst.

Botis inornatalis, n. s.

Expanse of wings, 13 m. m.

The head and palpi are pale snuff brown, the latter extend forward as far as the length of the head in front of it, and they are whitish underneath at the base, and the superciliary line is white.

The thorax and fore wings are of a light vinous red or reddish pink color, very near the color of *Botis signatalis*, but without markings of any kind. Fringes paler than the wings at the base, but whitish on the outer part.

Hind wings pale fuscous, lighter at the base, and stained with vinous red along the outer margin. The abdomen is concolorous with the hind wings.

Under side of the fore wings silky, fuscous and stained with vinous along the outer part of the costa. Under side of the hind wings lighter than above. Under side of the body, middle and hind legs, white and silky. The fore legs are pale fuscous.

This beautiful little species was collected in Florida and sent to me by Rev. Geo. D. Hulst.

CORRESPONDENCE.

XYLORYCTES SATYRUS.

Dear Sir: In answer to Dr. H. A. Hagen's query in the ENTOMOLOGIST for Dec., 1884, I have to say that some four years ago a boy brought me a living specimen, a fine male, of *Xyloryctes satyrus*, which he had taken in Bleecker's Woods, just outside of the city limits.

JAMES T. BELL, SC. D.

Belleville, Ont., Feb. 17th, 1885.

Dear Sir: Dr. Hagen asks in Dec. No. (Vol. xvi., p. 239) whether this beetle occurs further north than Pa. I find it recorded by Zesch and Reincke in their list of species captured within fifteen miles of Buffalo; by Howard and Schwarz in list of Coleoptera of lower peninsula of Michigan, presumably from Detroit; by Pettit, as captured at Grimsby, Ont., and by Prof. Bell, as taken near Belleville, Ont. It also occurs here—and this is probably the most northerly record for it—but is apparently rare. The only specimen I possess is a ♂ which was brought to me alive by a friend, but I have several times met with the elytra and other fragments of dead specimens in or under decayed logs. It is of course noticeable as being our largest representative of the Scarabæidæ, which in these colder regions only muster about forty species.

W. HAGUE HARRINGTON.

Ottawa, 25th Feb., 1885.

Dear Sir: I am able to add to the kind answers to my query by Messrs. G. Dimmock and S. Henshaw, two more. Prof. Chas. V. Riley writes me that August 18th, 1871, he found larvæ, pupæ and fresh beetles of *X. satyrus* quite common at Ridgewood, N. J., under old leaves in the

woods, especially in moist hollows: August, 1878, he found the beetles quite common, and in fact injuring the roots of ash trees in Babylon, L. I. Miss Emily L. Morton, Newburgh, N. J., states the frequent occurrence of *X. satyrus* on Long Island at various places, but has never seen a specimen of it taken in her own collecting grounds, New Windsor, N. Y., or vicinity. I have never made any lists of the distribution of insects except, of course, for some orders which belong to my special studies; but I have many times missed such a reference list for Coleoptera. I have been now informed that such a list is in the way of preparation. Even if I had time enough to undertake such a large work, I would have been prevented from doing it for a certain reason. If local lists should be taken as a basis for such a reference list of N. Am., it would be necessary to assume that the determinations of the species are unquestionable. That this is not the case in some lists of Coleoptera and Lepidoptera, I have been shown by specialists. Therefore if such a reference list should be of value, it must be worked by specialists who are able to control carefully the determinations. As in my large correspondence I am often asked to give information of the occurrence of species in certain localities, my way to answer these queries is to consult the collections in my care. So for beetles, the N. A. collection formed out of the collections of Melsheimer, Ziegler, Lewis, A. Agassiz, and all other beetles, formerly belonging to the Museum. Further, the collections of Dr. LeConte, Lt. Casey, and of the Peabody Academy, the two latter ones now belonging to the Museum; and finally of the general collection. If the result is not sufficient, I would like to apply to the knowledge of specialists, and the prompt answers now given will mostly settle the question. I should add that at least for Lepidoptera, I did begin the arrangement of the collection in a way to form a reference list, in placing a specimen of every State and of other important localities in the boxes, to have a graphical view of the distribution of each species. I have retained for this purpose specimens often in a very bad condition. But this plan, by which sometimes a whole box was needed for one species, outgrew the given limits of space. Nevertheless, for Odonata and some other families belonging to my specialty, I still retain this arrangement, which has given for some species of large distribution two closely filled boxes, and even more. When such species are studied and finally outworked, it will be of course possible to diminish the number of specimens. It would be an error to believe that I could do all this myself. My intention is to bring all specimens present in the

collection together in such a manner that the monographer or the student can find now or in later times the material which he needs for his study. To draw the attention of students to parts of the collection which are arranged as far as my knowledge goes, I did begin to publish during the last year lists of the contents of the collection, and will go on with such publications if they should prove to be useful. Through the addition of the collection of the Peabody Academy, the Museum possesses a very large number of types for Heterocera and Micro-Lepidoptera of N. Am., and a very large number of types of Europe. I have during many years given especial care to bring together a collection of types of the European fauna for comparison with the fauna of N. America.

Concerning my list of the Phytoptoceridia, I was most agreeably surprised by a letter of Prof. S. A. Forbes, and by a copy of the 12th Report, in which Mr. H. Garman has given an excellent paper on the Phytopti and other injurious plant mites. The copy of this Report which he has formerly forwarded to me has never reached my hands. As this paper is not quoted in Justis Jahresharict, it is new to me, and I am glad that the list is now directly advanced by such a prominent paper.

H. A. Hagen.

EUPTOIETA CLAUDIA.

Dear Sir: In reply to the letter of Mr. Thos. E. Bean, in the Jan'y number of the Entomologist, I took several specimens of *Euptoieta claudia* last season in the Calgarry and Goose Lake region, and *Pyrameis cardui* was so plentiful from Toronto to Br. Columbia that I hardly considered it worth while to publish it on the list. *E. claudia* is added to my list in the Dec. number. I took the larvæ of *cardui* on both thistles and nettles all along the route. Yours truly,

Gamble Geddes.

Government House, Toronto, 25th Feb., 1885.

[*E. claudia* was also among the insects collected by Miss F. M. Pierce, of Moose Mountain, N. W. T., last year, and forwarded for our Society's collection.—Ed. C. E.]

The Canadian Entomologist.

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DESCRIPTION OF SOME OF THE PREPARATORY STAGES OF PARNASSIUS SMINTHEUS, Doubl., AND OF P. CLODIUS, Men.

BY W. H. EDWARDS, COALBURGH, W. VA.

P. Smintheus.

Mr. W. L. Courtis, in 1883, sent me many eggs of this species, laid by females confined with Sedum. All the butterflies were of the variety *Hermodur*, H. Edw., the females being very black. I related Mr. Courtis's observations in Papilio III., p. 158. The eggs were forwarded to Dr. H. S. Jewett, Dayton, Ohio, in default of ice here, and were placed in an ice box in that town, and so remained till late in Jan., '84. I received them 28th. Two days after, several of the eggs were found to have hatched, the day being warm, 55° Far. at noon. I gave the larvæ leaves of our wild Sedum, and also of some cultivated sorts that I had brought together for the purpose. Three days later the wild leaves were noticed eaten or nibbled a little, the other sorts not all. In former years, at least twice, I had had these larvæ out of egg, and they refused our Sedum and starved. In the present case, little holes were eaten on the upper side of leaf, half way through the fleshy part. Several larvæ died speedily, but a few did well. On 5th Feb'y, two were visibly stouter than the rest. On 6th, I happened on some larvæ feeding, this time at the edges of the leaves. On 8th, the two largest began to swell at second segment; on 10th, one of these died in the effort to moult, the time from the egg being 11 days. On 12th, the other larva passed 1st moult, at 13 days. On 15th, a third passed same moult; next day another, and I was fortunate in seeing the process. Before this moult I endeavored to make the larvæ disclose the tentacles on second segment, and did so in some cases by pressing on the dorsum of segments after 2 with flat side of a pin. Teasing with the point of the pin effected nothing. The tentacles were stubby and very short, a mere lump of brownish-yellow color, without prongs. It was rather a tentacle, than tentacles. On 18th, another passed 1st moult. By pressing on dorsum, the tentacles after first moult

were brought out, two short stubby horns, bifurcated low down, color greenish-yellow, with a tint of brown.

On 22nd, the first larva which passed first moult was swollen for second; remained in that condition a long time, and finally passed second moult 27th. On 6th March, another was swollen for same moult. There were then but half a dozen left out of perhaps three score larvæ from the egg. Day after day they died, and by 11th every one had died. So that only one passed 2nd moult. This is but a melancholy showing, but it was much to get descriptions of three larval stages, and greatly enlarged drawings by Mrs. Peart of the first two stages. I learned something by the experience, and with another opportunity, I may perhaps reach pupa and imago. I got from Dr. Staudinger a beautifully prepared blown skin of Parn. *Apollo*, and from that could see that the larva of *Smintheus* at maturity would be closely like it. It was like it at the second stage, that is, with the first moult the larva had put on the characters of maturity very nearly.

I will give herewith the description of the stages observed, as it may be long before any thing more is known of this species, or of the preparatory stages of any of our Parnassians.

Egg.—Flattened, depressed at summit about the micropyle, the sides curved; the surface encrusted in hexagonal pattern, at each angle of every figure a minute cell; color chalk-white. Figured and described in But. N. A., vol. 1. The shape is like that of a Lycaena.

Young Larva.—Length .08 inch; cylindrical, tapering both on dorsum and sides from 3 or 4 to last segment, each segment well rounded; much covered with long, stiff, black hairs, or bristles; on dorsum are four rows of these, each hair springing from a little tubercle; on 2, 3, 4 these are arranged in a cross row, on the middle of the segment, on 2 they are equidistant, but on 3 and 4 there is a wider space between the 2nd and 3rd tubercle than the others; also on 2 is another cross row of 4 near the front, the pair on either side mid-dorsal line nearer together than the posterior tubercles on same segment; segments 4 to 13 inclusive have these hairs disposed in two rows, one being on the front part, the other on posterior part, and more widely separated; so that on these segments there are formed two dorsal longitudinal rows, and two sub-dorsal; the hairs on anterior segments are curved and directed forwards, from 5 to 10 are nearly erect, but still turned forwards; on the last segments turned back; high on the side is a row of large, flattened tubercles from 2 to 11, and

from each spring four hairs, separated at their bases, turned forwards and downwards; on 2, 3, 4 is a demi-row, mid-lateral, of similar but smaller and flattened tubercles, each bearing three hairs; lower down, and just below spiracles, on 4 to 13, are 2 hairs to each segment, from little tubercles not in line, but placed obliquely, so that the posterior tubercle is always a little above the other; along base, over feet and from 2 to 12, are 2 fine and short hairs to each, near together, turned down; some larvæ have all the large tubercles black, others have them light gray; the hairs are all light but black at base; under side and prolegs greenish-brown, the feet black; head obovoid, long, broader than high, depressed at top, the vertices rounded; black, the surface rough, with many fine black hairs; the larva from the first is able to project its tentacles, very short, pale brown-yellow, and so far as observed not bifurcated. Duration of this stage from 11 to 15 days.

After First Moult.—Length at 24 hours, .18 inch; shape as in first stage: color velvet-black, the lower part of side and under side greenish-brown; the processes on body are much as at first stage, but instead of single hairs from minute tubercles over dorsum, there are now four rows of small glossy black flattened tubercles, placed just as were the others mentioned, namely, two straight cross rows on 2, one row on 3, 4 each, in all these four in the row; in the following segments two cross rows each, two tubercles to the row, on front and rear, the former near together, or dorsal, the latter more separated and sub-dorsal; each of these tubercles bears four short hairs, separated at their bases; the upper lateral tubercles are large, rounded, flattened, running from 2 to 12, and bear from six to eight hairs; the demi-row on side of 2-4 is nearly in line with the tubercles below spiracles from 5 to 13, and this may be considered as a continuous lateral row, the lower lateral: on 2-4 there is a single tubercle to each, size of the dorsals, but the succeeding segments have two each, smaller, close together, the posterior one of the pair always a little higher than the other; the first three have five hairs each, the rest four, except on 13, where the tubercles are very small, and bear one or two hairs only; the hairs vary in length on each tubercle over the body, and in addition there are scattered hairs from the surface everywhere; on the dorsum of 2 the interior tubercles coalesce and are enlarged, and the hairs therefrom bend forward over the head; from 2 to 12 inclusive, in line with the upper lateral tubercles, on the posterior part of each segment, is a deep yellow oval or rounded spot; and on dorsum, between and in line with the sub-

dorsal tubercles, from 5 to 12, is a small and paler yellow oval spot; so that in all there are four longitudinal rows of these spots, the outer pair large, the inner small; legs black, pro-legs greenish-brown; head shaped as before, black, rough, with many scattered short hairs. Duration of this stage 15 days, in the only example which reached 2nd moult.

After Second Moult.—Length at 24 hours, .24 inch; in all respects as at second stage, except that the spots which were then yellow are now white. Before the third was completed the larva died.

The inflated skin of Parnassius *Apollo* spoken of above will serve to show what the mature larva of *Smintheus* would be like. The *Apollo* is black, covered thickly with short stiff black hairs. Where in the larva of *Smintheus* at 1st moult, is a row of yellow spots, in *Apollo* there is a row of large red ones, extending from 2 to 11, with smaller ones on 12 and 13. Instead of a dorsal row of smaller spots as in *Smintheus*, in *Apollo* the small spots are in line with the large ones, one on the front of each segment, and between 2 and 3, 3 and 4, is a small spot in addition. It is possible that the spots of *Smintheus* may again change color (having once changed from yellow to white, at 2nd moult) but I apprehend the white spots will remain till maturity.

The larva of Parnassius at every stage is unlike that of a Papilio, the only resemblance being in the presence in both of the scent organs, and the young larva seems to me more like that of certain Erycinidæ, for example, Lemonias *Nais*, as figured in But. N. A., V. 2. The egg is like Lemonias and Lycaena, and as is well known, the chrysalis is like that of a Hesperid, or some of the Heterocera, and very unlike the typical Papilionidæ. The more I see of the Parnassians, the more satisfied am I that their place is not with the Papilionidæ, but at the other end of the series, and near the Erycinidæ, where they should rank as a Family. I believe that the egg, larva in its stages, and the chrysalis is a better guide to the relationship of butterflies than the characters of the imago.

P. CLODIUS, Mén.

Egg.—Nearly plano-convex, the top being arched, the base flat, the edge about base rounded; at the summit a depression about the micropyle; when magnified to one inch diameter, the shape is very like that of a wooden button; color diluted coffee-brown; the upper surface covered by a crust, which is pitted with little round cells. (This egg much

resembles in shape and ornamentation that of Chrysophanus *Thoe*, whereas the egg of *Smintheus* is like a Lycaena, as L. *Pseudargiolus*).

Young Larva.—Length at a few hours from egg, .08 inch; shape and markings of *Smintheus* at same stage; tapering on dorsum and sides from 3 or 4 to 13; the segments well rounded; color black, legs black, under side and pro-legs dark greenish-brown; on dorsum and sides black hairs, which spring from tubercles just as in *Smintheus*, the arrangement being of same description; head ob-ovoid, depressed at top, the vertices rounded; surface rough; color black; much covered with short black hairs.

The larvæ refused to eat Sedum, and soon died. In 1878, Mr. Mead brought from Nevada a large number of these eggs, obtained by confining the females on Sedum. I kept them in a cool room till last of Jan., '79, when they were placed in a warm one. A few larvæ hatched 31st Jan.

A NEW ARCTIAN.

BY HENRY EDWARDS, NEW YORK.

Nemeophila Selwynii, n. sp.

Head, thorax and abdomen, dull sooty black. Palpi, collar and tip of abdomen pale dull orange. Tegulæ, sides of abdomen and upper side of the tip of antennæ sordid white. Wings dull sooty black. At base of primaries a very distinct and clearly marked short white streak, and an oblique band (also cream white) from behind the middle of the costa to near the internal angle. This band, which is excavated at its junction with the cell, gradually narrows to a point as it reaches the outer margin. The fringe is white on the apical half of the margin, black elsewhere, and there is a small orange dash at the base of the costa. Secondaries wholly sooty black, fringe white, a little below the apex. Beneath the wings have a slate-colored shade, the markings of the upper surface repeated, the costa of primaries stained with orange at the base and at the edge of the white oblique band, while that of the secondaries has two whitish triangular blotches.

Expanse of wings, 35 m.m. Length of body, 13 m.m.

From 7 examples, ♂ ♀, taken by Prof. Macoun at Nipigon, Ont.

Though the species of the genus *Nemeophila* are subject to considerable variation, I can but believe that in the form before us we have to do

with a distinct and permanent species, the whole of the examples captured agreeing exactly with each other. It differs from *N. petrosa* Walk., *N. geometrica* Gr., and *N. Geddesii* Newm., in the shape and position of the bands on primaries, while in all the specimens examined there is on the secondaries an entire absence of white marks.

I have dedicated this interesting insect to Dr. Alfred R. C. Selwyn, LL. D., F. R. S., F. R. S. C., the distinguished Director of the Geol. and N. Hist. Survey of Canada, whom I have known for many years, both in Australia and America, as a close and careful student, and who has already taken important steps which cannot fail to promote a love for Entomology throughout the Dominion, and to produce the most valuable scientific results.*

A LIST OF COLEOPTERA COLLECTED IN LOUISIANA, ON OR SOUTH OF PARALLEL 30°.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

The following species were collected, from 29th March to 21st June, 1884, along the thirtieth parallel in two neighborhoods, New Orleans and environs, and a district on Bayou la Fourche extending from a little above Napoleonville a few miles south along the bayou. The latter is in Assumption Parish, and at the time of my visit was partially overflowed from the great crevasse of March, 1884. Though many of the species here given are well known to occur in the South Louisiana fauna, I give them all just as I collected them, with the view of noting their relative abundance or rarity, dates of occurrence, localities, etc., all of which together may contribute to make our knowledge of the fauna more complete. But it must be remembered that this is merely a record of how the species occurred to me during my stay, in which I collected only a small part of what might have been taken, could I have given my entire attention thereto. Nearly all those of the N. O. neighborhood were taken between the city and Lake Pontchartrain.

Some observations and notes on a number of the species in this list have been published in *Psyche* ("Notes on Some Coleoptera Taken in

* The exact locality and date of capture of this Arctian are thus given by Prof. Macoun: "In open grassy woods along an old road between the Hudson Bay Store and the C. P. R. track, three miles east of Red Rock Station, and one mile west of Nipigon Bridge, June 26th, 1884."

South Louisiana." *Psyche*, vol. iv., p. 219–222). For the identification of the species (except those marked with an asterisk) I am indebted to Dr. G. H. Horn, who kindly examined them for me.

CICINDELIDÆ.

Tetracha carolina (Linn.) One full grown larva dug from its hole, 10th April. Milnburg Road.*

Cicindela repanda Dej. One specimen seen (not taken) in an unpaved side street in New Orleans, first part of April. Same species seen also at the mouth of the Red River in Louisiana, 22nd June, and taken at Vicksburg, Miss., 23rd June.

" *tortuosa* Dej. One specimen taken on a low, sandy mud-flat of the Mississippi just below the mouth of the Red River in Louisiana, 22nd June. In company with *repanda*. This is the only species in the list which was not taken (or seen) on or south of parallel 30°.

CARABIDÆ.

Scarites substriatus Hald. Of occasional occurrence under logs in moist places, N. O.

" *subterraneus* Fabr. Same with preceding, N. O.

Brachynus lateralis Dej. A number taken under old wood on the edge of a wet forest, B. la F.

" *tormentarius* Lec. In colonies, often in company with *Galerita*, under logs (old railroad ties) and pieces of wood in low, moist places, on the edge of the swamp especially. †

" *fumans* (Fab.) A number taken under logs in drier places than preceding. N. O.

Panagæus crucigerus Say. One specimen under a log on the edge of a muddy, wet forest, 4th May. B. la F.

Galerita janus Fabr. This and the next species in same places with *Brachynus tormentarius;* often found in company with that species.‡ Also overtaken running through passages made in a

* There are dummy roads running through the swamp from New Orleans to Milnburg, Spanish Fort and West End, three resorts on Lake Pontchartrain.

† Where no locality is given, the species will be understood to have been taken both in vicinity of New Orleans and on Bayou la Fourche.

‡ Where no date is given, unless otherwise stated, the species was more or less common during the time of my stay.

dry, rotten stump, probably by ants. Once attracted to lamp in the evening.

bicolor Drury. With preceding.

Casnonia ludoviciana Sallé. Three specimens taken from the inside of my canoe while out in the flooded forest; two of these, 13th June. Probably came from foliage. B. la F.

Leptotrachelus dorsalis (Fabr.) Two specimens taken separately on the heads of a wayside herb, 15th May, B. la F. They emitted a scent peculiar to many Carabs when disturbed.

Lebia viridis Say. One, B. la F.

" *analis* Dej. One, B. la F.

Apenes sinuata (Say). One, B. la F.

Callida decora (Fabr.) Several taken on foliage of elder hunting for prey, 23rd May. One at lamp in the evening, 15th May. Two others seen on the ground in the sun, first part of May. B. la F.

Platynus decorus (Say). One under old wood. N. O.

Loxandrus rectus (Say).

Pterostichus chalcites (Say). Several taken under old wood and clods of dirt, also running; uncultivated land and plantations.

Diplochila laticollis (Lec.) Several under old wood.

Dicaelus purpuratus Bon. Several under wood or logs. B. la F.

" *elongatus* Dej. One, same as preceding. B. la F.

Chlaenius fuscicornis Dej. Under logs and drift-wood.

" *laticollis* Say. With preceding. Also once attracted to lamp in the evening.

" *nemoralis* Say. With preceding, but occasionally in drier places and away from woods. Not many taken.

Anisodactylus dulcicollis (Laf.)

Selenophorus palliatus (Fabr.) One, B. la F.

Stenolophus ochropezus Say. One, B. la F.

" *dissimilis* Dej. Attracted to lamp in the evening. B. la F.

DYTISCIDÆ.

Cybister fimbriolatus Say. Several taken from a pool of water, 17th April, N. O. A pair (same species?) seen *in coitu* swimming on the edge of an overflowed forest on Bayou la Fourche, 23rd May.

Thermonectes basilaris (Harr.) One specimen in pail of water drawn from a cistern, 3rd May. B. la F.

GYRINIDÆ.

Dineutus emarginatus Say.

STAPHYLINIDÆ.

Staphylinus cinnamopterus Grav. One or two under old wood. B. la F.
Palaminus parcus (Lec.) One under wood, N. O.

EROTYLIDÆ.

Languria mozardi Latr. Several from plants.
" *angustata* (Beauv.) One on foliage (of elder?), 23rd May. B. la F.

NITIDULIDÆ.

Carpophilus dimidiatus Fabr. Two, B. la F.

COCCINELLIDÆ.

**Megilla maculata* (DeG.)
**Hippodamia convergens* Guér. B. la F.
Coccinella affinis Rand., and var. **venusta* Mels. Two specimens of the species, three of the variety, on foliage. B. la F.
**Cycloneda sanguinea* (Linn.)

LUCANIDÆ.

**Passalus cornutus* Fabr. B. la F.

SCARABAEIDÆ.

Canthon perplexus Lec. One, B. la F.
" *hudsonias* (Forst.) One, N. O.
Diplotaxis harperi Blanch. One, B. la F.
Anomala undulata Mels. One or two, B. la F.
Dyscinetus trachypygus Burm. Two, one from each neighborhood.
Ligyrus gibbosus (DeG.) One specimen in a cell in the earth in a sugar-cane row, about the first of May. B. la F.
" *rugiceps* Lec. One specimen in a cell in a cane row same as preceding, 2nd May. B. la F. *Ligyrus* did no injury to young cane about Napoleonville this season that came to my knowledge.
Euphoria melancholica (Gory). Quite abundant in flowers of thistles, also in some other flowers.

BUPRESTIDÆ.

Dicerca obscura (Fab.) Several specimens taken in the heat of the day on heads of wormwood and the common ragweed, 20th to 22nd May. B. la F.

ELATERIDÆ.

Drasterius dorsalis (Say). Several under old wood. B. la F.

Monocrepidius lividus (Deg.) One taken on the head of a stalk of wormwood, 21st May. B. la F.

LAMPYRIDÆ.

Lucidota atra (Fabr.) B. la F.

Pyropyga minuta Lec. One on foliage. B. la F.

Photuris pensylvanica (DeG.)

TELEPHORIDÆ.

**Chauliognathus marginatus* (Fabr.) Abundant on patches of a low, yellow-flowering herb; also on daisies and some other flowers. *In coitu*, 30th March to 17th April.

CERAMBYCIDÆ.

Elaphidion mucronatum (Fab.) One specimen, 21st May. B. la F.

" *incertum* Newm. Two taken on pine boarding, 5th and 9th June; and one attracted to lamp in the evening, 21st May. B. la F.

Xylotrechus colonus (Fab.) One attracted to lamp in the evening, 10th June. B. la F.

Neoclytus erythrocephalus (Fab.) One specimen taken in the heat of the day on the finely-cut foliage of the common ragweed, 18th May. B. la F.

**Desmocerus palliatus* (Forst.) On shrubs of elder bordering ditches on plantations, 21st to 27th April. *In coitu* 22nd to 27th April. B. la F.

Bellamira scalaris (Say). Several taken on elder and the common ragweed, 20th to 22nd May. *In coitu* same dates. B. la F.

Typocerus zebratus (Fab.) One, B. la F.

Leptura abdominalis Hald. Three specimens taken in the flooded forest on a pine or cypress stump, over a mile back of the levee, 6th June. One of them flew from the stump and alighted upon the foliage of a young tree, where it was captured. B. la F.

Acanthoderes quadrigibbus (Say). Several specimens taken on an unpainted, weather-beaten fence made of big, rough-hewn pickets, also one on a flour barrel and another on pine boarding, 16th to 25th May. B. la F.

Mecas inornata Say. Taken in considerable numbers exclusively upon

the leaves of the "wild artichoke," 25th May to 7th June. *In coitu* 2nd to 6th June. B. la F.

BRUCHIDÆ.

Caryoborus arthriticus (Fab.) Four dead and dried specimens found in September among some seeds of the scrub palmetto gathered near New Orleans in the first part of April, and with them were the hollow seed-shells from which they had emerged.

CHRYSOMELIDÆ.

Lema 6-punctata (Oliv.) One taken upon the leaves of some weeds along a low levee bank, 23rd May. B. la F.

**Chlamys plicata* (Fabr.)? One larva, a case-bearer, on foliage. B. la F.

Monachus saponatus (Fab.) Several. B. la F.

Cryptocephalus leucomelas Suffr. One specimen on a weed, 17th April. Spanish Fort.

Myochrous denticollis (Say). Two, B. la F.

Colaspis brunnea Fab. One perfect and one injured imago. B. la F.

**Plagiodera scripta* (Fabr.) In abundance on sprouts of cottonwood or poplar, both larvæ and imagines, and pairs *in coitu*, on the young and tender leaves, 4th May. B. la F.

Cerotoma caminea (Fab.) Several. B. la F.

**Diabrotica 12-punctata* (Oliv.)

Galeruca integra (Lec.) One. B. la F.

Disonycha pensylvanica (Illig.) One from each neighborhood.

Lactica ocreata Say. Several, B. la F.

Systena elongata (Fab.) One, B. la F.

Chelimorpha cassidea (Fab.) One specimen taken on a wild plant, 17th April. Spanish Fort.

Coptocycla aurichalcea (Fab.) One on a leaf of elder, 28th April. B. la F.

Noda convexa Say. Several, B. la F.

TENEBRIONIDÆ.

Nyctobates pensylvanica (DeG.) Two or three under dead bark, 27th April. B. la F.

Opatrinus notus (Say). Plentiful under old wood in dry places.

Tribolium madens (Charp.) One, N. O.

Alphitobius piceus (Oliv.) Several under old wood, N. O.

Strongylium tenuicolle (Say). One, B. la F.

MELANDRYIDÆ.

Penthe obliquata (Fabr.) Three under a log, 27th April. B. la F.

MORDELLIDÆ.

Rhipiphorus pectinatus (Fabr.) One on leaves of a wayside herb, 11th May. B. la F.

MELOIDÆ.

**Epicauta vittata* (Fab.) One running on the ground, 1st May. B. la F.

OTIORHYNCHIDÆ.

Tanymecus confertus Gyll. Two, B. la F.

Eudiagogus rosenschoeldi Fahrs. Two, one taken crawling on the ground by a road-side, 11th May, B. la F.; the other from N. O.

CURCULIONIDÆ.

Listronotus tuberosus Lec. Quite a number of this species taken clinging on the under side of railroad ties lying on the ground not in use, or pieces of wood in dry places, in company with the three following, first part of April. Milnburg Road.

" *callosus* Lec. With preceding, plentiful.

" *nebulosus* Lec. With two preceding, quite numerous.

" *frontalis* Lec. A number with the three preceding.

Macrops delumbis (Gyll.) One or two with *Listronotus.*

Eudocimus mannerheimii Boh. One pair *in coitu* taken in the flooded forest on a pine or cypress stump, over a mile back of the levee, 6th June. They were lying under a chip in a crevice on the top of the newly-cut stump. B. la F.

Lixus terminalis Lec. Two taken on stems of weeds, 27th April and 25th May. B. la F.

Lissorhoptrus simplex (Say). Several attracted to lamp in the evening, 14th and 23rd May. B. la F.

Conotrachelus cribricollis (Say). One, B. la F.

Chalcodermus aeneus Boh. Abundant on stems of elder along ditches on plantations, also taken on some young sprouts of cotton-wood or poplar. B. la F.

Baris nitida Lec. One, B. la F.

*Unknown *Rhyncophor.* Larvæ taken, 18th April, from tamarind seeds found strewn over the planks of the "levee" at New Orleans, where the Central American and Mexican steamers come in. One seed contained six or eight small, white larvæ, nearly spherical. At same time some of the larvæ were found in

other seeds, almost minute. Probably brought from some tropical American port.

BRENTHIDÆ.

Eupsalis minuta (Drury). Three ♂ specimens taken under chips, or in crevices, on a new pine or cypress stump over a mile out in the flooded forest, 6th June. B. la F.

CALANDRIDÆ.

**Rhodobaenus 13-punctatus* (Illig.) Quite plentiful on a wayside herb growing along the bayou on the grassy bank of the levee, and on the leaves and stems of the common ragweed, 11th May to 6th June. B. la F.

Sphenophorus pertinax Oliv. Under logs and pieces of wood in damp places burrowing in the mud, on which account they are generally covered with a crust of that material. Not uncommon near New Orleans (Milnburg and West End Roads); only one taken on Bayou la Fourche.

" *placidus* Say. In same places with preceding, but much less common. Only two taken, N. O.

**Calandra oryzae* Linn. In rice; and from an ear of Indian corn, every kernel of which was eaten out hollow and contained each a perfect weevil, 16th June. B. la F.

ANTHRIBIDÆ.

Araecerus fasciculatus (Deg.) One, B. la F.

A WELL MERITED DISTINCTION.

The Entomological Society of France, at its meeting, March 11th, elected George H. Horn, M. D., Philadelphia, an honorary member, on account of his writings and scientific attainments in Entomology. This is a very great compliment, when it is considered that the Constitution of this Society—one of the most learned in Europe—limits the number of its honorary members to twelve, six native and six foreign.

DESCRIPTION OF A NEW SPECIES OF CHIONOBAS FROM BRITISH AMERICA.

BY W. H. EDWARDS, COALBURGH, W. VA.

CHIONOBAS MACOUNII.

MALE.—Expands 2.2 to 2.4 inches.

Upper side brown-orange, color of *C. Californica* Boisd.; occasional examples are dark, a dead-leaf-brown over whole surface; hind margins edged by a blackish border, of nearly equal width throughout, and extending to apex of primaries; but sometimes this border is widest on primaries; costa of primaries dark brown; in some examples this shade scarcely if at all crosses costal nervure, in others it encroaches on the cell more or less, and occasionally covers the whole cell; but in nearly all examples under view the cell is concolored with rest of wing; the oblique discal brown band, which is a conspicuous feature in the males of the allied species, does not appear in the present one, so far as the examples show; the coloration of the upper surface resembles that of the female of *Californica;* on secondaries, the costal margin is edged with brown, and just outside the end of cell is an expansion of this, which forms a large elongated patch, convex on interior side—not at all like the sub-triangular and small patch seen in *Californica* and *Iduna;* primaries have a black ocellus, rounded or oval, with white pupil on upper discoidal interspace, and a second on second median interspace, the last one usually blind, but sometimes pupillated; generally the lower ocellus is smallest, but occasionally is equal to the upper; one example under view has two additional black spots, as large as the ocellus on secondaries, one on the interspace next above each ocellus; another has mere points on these interspaces; secondaries have a small ocellus, either blind or with white pupil, in second median interspace; fringes of both wings alternately yellow-white and brown-black.

Under side of primaries paler, frequently yellowish; costal edge gray-white, specked and streaked transversely with dark brown, next before and at apex gray prevailing; the hind margin brown; the cell more or less specked with brown, and just beyond the middle from base crossed by a narrow brown stripe.

Secondaries usually gray-white over costal margin and to middle of cell, yellowish over remainder of wing, but sometimes the entire surface is

decidedly yellow, of a pale or whitish shade; streaked finely with dark brown most densely from base to outer edge of the discal band, beyond which the streaks permit the ground color to show more distinctly than elsewhere: in the darker examples the hind margin is washed with brown which shades gradually into the lighter area; the disk crossed by a broad irregular band, edged on either side by black; the outer border of this band begins on costa just above the angle and its general course is sinuous, with a slight angular incision on the sub-costal nervure, and a rounded one on lower median interspace, the extreme curve lying just outside the nervule; the outline of basal side of the band is a double curve, being at first convex towards base of wing, and on sub-costal, then a deep sinus on median, after which to inner margin wavy; the posterior half of the band is about half the width of the other part; on both wings the ocelli are repeated, and usually the lower on primaries is pupillated; in a line with the ocellus on secondaries is a series of white points across the wing, one on each interspace, but these are often wanting.

Body blackish-brown above, thorax black beneath, gray-brown over abdomen; legs black, the tibiæ and tarsi brown; palpi black; antennæ reddish-brown finely ringed with red; club yellow-brown, tipped ferruginous.

Var. A.—The entire upper side of primaries dark brown except a space beyond the disk which includes the ocelli, this being of the usual shade, and like secondaries; and it is therefore like the band in Satyrus, as *S. Alope;* on under side the ocellar band is yellowish, and the dark area is limited on it in a wavy dark line which projects in an angle upon upper branch of median; the cell much streaked.

FEMALE unknown.

From 12 males, taken by Professor John Macoun, Botanist to the Geological and Natural History Survey of Canada, at Lake Nipigon, 1884, and in honor of whom I name the species. It is remarkable for the absence of the broad sexual brown-black band on fore wing, which is so conspicuous a feature of the other members of the group. It forms the connecting link between the *Californica* group and that of *Chryxus*. The upper surface of the Var. A is very like many male *Chryxus* in the arrangement of the light and dark shades of color. In general the male *Macounii* has the coloring of female *Californica*.

HATCHING LEPIDOPTERA THROUGH ARTIFICIAL HEAT, &c

(Continued from page 49, No. 3, 1884.)

BY PH. FISCHER, BUFFALO, N. Y.

Of the lot taken to the room Dec. 3rd, 1883, imagoes appeared as follows:—

Hem. tenuis, male, Jan. 16, 1884.
" " " 27 "
Telea poly., " " 27 "
Apat. lepusc., " 27 "
Telea poly., male, Mch. 10 "
" female, " 16 "

Pupæ from Feb. 1, 1884.

H. tenuis hatched 1 male, Feb. 24
" " 2 females " 26
" " 1 male 27
" " 1 " Mch. 1
" " 1 female " 3
" " 1 male " 4
" " 1 " " 13
" " 1 " " 14

Pupæ of different genera, Feb. 28, hatched as follows:

H. thysbe, male, March 13.....1
H. thysbe, female, Mch. 14.....2
" " " 30.....1
D. undulosa, male, Apr. 8.....1
Sph. drupifer. " " 18.....1
H. tenuis, male, fem. " 23.....2
" " " 26.....1
Sm. myops " May 9.....1
" female " 11.....1
D. chœrilus, male " 11.....1
Sm. myops " " 13.....1
" female " 14.....1
C. promethea, male " 30.....1
S. cecropia, female " 31.....1
T. polyph., male " 30.....1
" " " 31.....1
C. promethea " " 31.....1
S. cecropia, female, June 1.....1
C. promethea, male " 2.....2

So far my records. From this time the remaining pupæ were taken to a room not heated, and gradually emerged here, which they would probably have done at about the same time had they never been taken to a warmed room.

On *Call. promethea* and *Samia cynthia*, artificial heat seems to have not the least effect, as they were taken to a warm room in February, the first *C. promethea* not hatching until the 30th of May. Of the *Samia cynthia*, none hatched until late in June, as did the larger number of *C. promethea*. A number of these, *promethea* and *cynthia*, male and female of each species, were taken to a small room with a view to observe the copulating of the sexes, and with a faint hope of a crossing, for which latter purpose males of one species *(promethea)* were also put together with

females of *cynthia*, and *vice-versa*, in boxes, but in no case did pairing take place, the males and females crawling over each other as if they were all of one sex. The one window of this room was kept closed, which must have been the cause of non-pairing, as there was no current of air, consequently the males, which seemingly have to depend a good deal on the draft of air, were not able to locate the female. One crippled female of *Telea polyphemus* was taken outside towards evening, in June, and placed on a shrub. It was found copulating the next morning with a fine male of the same species, the female commencing to deposit its eggs during the following night. This shows that for successful copulating insects need the fresh air.

Of *Hyperchiria io* hatching in February and March, some (male and female) were also put together in a large box covered with gauze, but with the same result; none were found to pair, although left together for a week, during which time some males and females never left the spot where they settled the first day. No female of these deposited any eggs during that time, whilst of *S. cynthia* and *C. promethea* sterile eggs deposited in June and July could be counted by the thousand.

Description of an odd variation of *Telea polyphemus*, male, hatched last summer: Wings almost transparent. Primaries almost without any shading, the usual band near outer margin removed nearer towards ocelli, which itself is narrower as in typical form, elongate, nearly perpendicular with sharply pointed ends above and below, surrounded with yellow, then black, having on margin towards base a red band slightly intermixed with pale blue; above ocelli a dirty red dash extending to costa; the lower part of the irregular band near base wanting, leaving only the upper part, which is also more perpendicular, and crescent shaped. Near base almost entirely bare.

Secondaries unicolored, the usual dark band removed close to ocelli, bordered towards outer margin with a broad bare band. Ocelli the reverse in shape from those on primaries; outer line straight and inner line convex; bordered towards outer margin with a black band extending on the outer side around ocelli, terminating in a narrow crescent-shaped black line above, encircling a narrow light blue band which is itself shaded by a darker blue, crowned by a wide white band bordered with red. A second pale but dark wide band runs almost parallel with first, only broken by ocelli, which is altogether but a little over half as large as on typical

form. Antennæ well developed. Thorax nude; abdomen slightly hairy. Coloring on under side also abnormal. Size 4⅛ inches. This specimen is in my collection.

NOTE ON THE LARVA OF DARAPSA VERSICOLOR, CLEM., AS IT OCCURS IN THE VICINITY OF BUFFALO, N. Y.

In my note book I find a brief description of the larva of *D. versicolor*, which I here give: Head small, green. Body light green, deepening strongly on sides, slightly tapering towards caudal extremity, but much towards head from 4th segment. Oblique bands whitish. Caudal horn long, stout, strongly curved backwards. Stigmata light brick red with white. The general appearance is much like *D. choerilus*, but from which it may be distinguished by its smaller head. As the season advances the larger number are a beautiful dark reddish brown, much resembling the dry leaves often found rolled up, on its chief food plant, *Cephalanthus occidentalis*, or Swamp Button-bush. The larvæ are sometimes found plentiful in certain favorable localities, especially shady swamps. It spins a light cocoon on the ground, in which the pupa hibernates. The pupa is nearly identical with *D. choerilus*. The larva is generally found in July, very few in August. When disturbed the caterpillar draws its head and first three segments into the fourth. The moth is local and usually rare.

OBITUARY.

We regret to announce the death of one of our esteemed members, Mr. Wm. Murray, of Hamilton, Ontario, who passed away after a protracted illness early in March. He was an enthusiastic and industrious collector of both Lepidoptera and Coleoptera, and paid special attention to the Sphingidæ and the Catocalas. His collection, embracing a large number of specimens, has been bequeathed to the Entomological Society of Ontario, and is now safely deposited in the rooms of the Society.

BOOK NOTICES.

Contributions to the Descriptive and Systematic Coleopterology of North America, Part II., by Thos. L. Casey, U. S. A.; lge. 8vo., pp. 137.

Contains very full and careful descriptions of ninety-three new species of Coleoptera, and many new genera; also systematic revisions of several genera as represented in the United States. A very useful and valuable contribution to this department of Entomology.

On the North American Asilidæ, Parts I. and II., by S. W. Williston, M. D.; lge. 8vo., pp. 58. From the transactions of the Amer. Ent. Soc., xi., December, 1883, and xii., Jan., 1885.

These excellent papers contain descriptions of forty-three new species, together with fresh descriptions of many of the older forms. Part I. contains a very complete table of genera, with two plates illustrating the parts of the insects used in classification. Part II. contains convenient tables of the species belonging to the following genera: Laphria, Mallophora, Promachus, Erax and Proctacanthus, in which the chief distinguishing features of the species are briefly given.

Notes on the Systematic Position of Some North American Lepidoptera, by John B. Smith; 8vo., pp. 8, with one plate containing twenty-three figures, illustrating the structure of Zygaena, Eudryas, Alypia, Stiria, Pyromorpha, Conosoma and Ctenucha.

The Standard Natural History—Article, Heterocera, by C. H. Fernald.

We are indebted to the author for a copy of this interesting popular article on Moths, covering 45 pages small quarto, illustrated with 34 figures and one plate of silk worm moths.

Elephant Pipes in the Museum of the Academy of Natural Sciences, Davenport, Iowa, by Charles E. Putnam; 8vo., pp. 40, with one figure.

General Truths in Applied Entomology, by C. V. Riley; 8vo., pp. 7.

An essay read before the Georgia State Agricultural Society, relating chiefly to insecticides and the best methods of applying them.

Recent Advances in Economic Entomology, by C. V. Riley; 8vo., pp. 3.

A communication made to the Philosophical Society of Washington in reference to insecticides.

U. S. Department of Agriculture, Division of Entomology; Bulletin No. 4, 8vo., pp. 102.

This useful publication contains a report on Cranberry and Hop Insects, by John B. Smith; observations on the Rocky Mountain Locust, by Lawrence Bruner; on Insects Injurious to Cotton, Orange and Sugar Cane in Brazil, by John C. Branner; Effects of Cold upon the Scale Insects of the Orange in Florida, and extracts from correspondence containing many interesting facts relating to injurious insects.

CORRESPONDENCE.

Dear Sir: In a recent issue, among some entomological notes, Mr. J. G. Jack mentions having taken *V. antiopa* and other butterflies on choke cherry bushes that were infested with Aphides. Perhaps some observations of mine bearing on the same point might be of interest.

During Sept., 1883, I noticed that a small apple tree in our orchard that was in a circuit of about twenty sugaring trees, had become unproductive, only an occasional moth appearing, while neighboring trees would be well covered. Happening to look up into the tree one night, I discovered that it was swarming with moths, and a careful examination showed that the tree was literally covered with the apple plant-louse, *A. mali.* The moths proved to be principally *L. unipuncta* and *Arthosia bicoloraga*, but there were some *Agrotis c-nigrum* and a few *Hadenas.* As I had never noticed this habit of the moths before, I kept on the watch for it afterwards, and found that the two former species could always be found where *A. mali* occurred in any numbers. During the autumn I took several species of the Noctuidæ, and at least one butterfly *(P. cardui)* on this infested tree. I have always taken *O. bicolorago* and *ferruginoides* largely on apple trees, and I now have little doubt but the plant lice are the principal attraction that draws them to these trees. I have also seen snow-ball bushes *(Virburnum opulus)* which were covered with Aphides, well patronized by the Noctuidæ, especially *Mamestra renigera*, *L. pallens*, *L. commoides* and *L. unipuncta.*

E. P. Van Duzee, Lancaster, N. Y.

The Canadian Entomologist.

VOL. XVII. LONDON, ONT., MAY, 1885. No. 5

FURTHER MATERIAL CONCERNING THE HESSIAN FLY.

COLLECTED BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The third report of the U. S. Entomological Commission, Washington, 1883, contains an excellent paper on the Hessian Fly, by Prof. A. S. Packard, p. 195-248, and in the appendix, p. 3-49, the translation of German papers by Loew, Wagner, Cohn, Koeppen, formerly not known by the Professor; also a reprint of my paper in the CAN. ENT., Oct., 1880, "The Hessian Fly not imported from Europe." The Professor accepts now (p. 238): That the Hessian Fly had appeared in the Eastern U. S. before the Revolutionary War, and that it could not have been introduced by the Hessians. He was not able to find in the files of the Pennsylvania *Mercury* and Philadelphia *Packet* some reference to the earlier occurrence of the H. Fly (App. p. 3).

I have tried since my paper was published to make further investigations in the old American literature. Some startling discoveries will probably necessitate the modification of some of the conclusions of the Professor. But I have frankly to state that I found it very hard to investigate the older literature. The publications treating agriculturally are rare, and at least in the libraries to which I have access, mostly incomplete. Mr. A. Fitch made the same complaint forty years ago. He was not able to compare some very important papers, though his publications show clearly that perhaps no one has tried to bring together the literature with a similar care.

The Occurrence of the Hessian Fly in North America before the Revolution.

The American Philosophical Society of Philadelphia appointed, in 1791, a committee for the purpose of collecting, and communicating to the Society, materials for the natural history of the insect called Hessian Fly, as also information of the best means of preventing or destroying the insect, and whatever else relating to the same might be interesting to agriculture.

At a meeting of the committee, April 17, 1792, it was resolved, that for obtaining information of the facts necessary for forming the natural history of this insect, *before its entire evanishment from among us*, it be recommended to all persons whose situation may have brought them into acquaintance with any such facts, to communicate the same by letter, addressed to Thomas Jefferson, Esq., Secretary of the State to the United States.

Nine questions were proposed, on which information was particularly wanted. I quote here only the first.

"In what year, and at what time of the year, was this animal observed for the first time? Does it seem to have made its appearance in this country only of late years, or are there any reasons for supposing that it was known in any part of the United States previously to the commencement of the late revolution?"

The resolutions of this meeting are printed in full in Carey's *American Museum* (Philadelphia, 1792, vol. xi., June, pp. 285-287) by the committee.—Thomas Jefferson, B. Smith Barton, James Hutchinson, Caspar Wistar. The *American Museum* was discontinued after 1792. The last volume contains no report of the committee.

As is obvious from the first question, it was at this time not settled whether the insect had been observed here before the revolution, or not. Mr. A. Fitch quotes the publication in the *American Museum*, and stated that no report had been made by the committee. The importance of this question, and of a committee with Jefferson at the head, led me to ask Prof. J. P. Lesley whether the old minutes of the Philosophical Society contain any unpublished report, or anything else relating to the Hessian Fly. I received from Mr. Henry Phillips, jun., secretary of the society, the following answer, under date of March 28, 1884:—

At the request of Prof. Lesley, I have examined our old minutes in reference to the Hessian fly, and append on next page the results of my search. I know *positively** that before the revolution our newspapers are full of communications in reference to the Hessian Fly *eo nomine*. I cannot call to mind any one paper, but I remember perfectly frequently seeing these articles when reading for other purposes. I cannot find that the committee ever reported.

* The Italics are by Mr. H. Phillips.

Extracts from the Minutes.

1768, May 18. Com. on husbandry to consider whether any method can be fallen upon for preventing the damage done to wheat by the Hessian Fly. [*N. B.*—Mr. DuHamel has written on the subject.]

1768, June 21. Paper on the Hessian Fly read by Dr. Bond; ordered to be published. See No. 4, original papers.

1768, Oct. 18. Col. Landon Carter, Sabine Hill, Va. Observations on the fly weevil destructive to wheat; ordered to be published. [Is published in Vol. I. of the Transactions of the society. Cf. Harris, Injur. Ins., pp. 502. Dr. H. A. H.]

1791, April 15. Jefferson, Dr. Barton, Hutchinson, Thomson and Dr. Wistar, a committee to collect materials for forming the natural history of the Hessian Fly, and the best means for its prevention and destruction. [Do not find this committee ever reported. H. P.]

1791, Aug. 19. Memoir on Hessian Fly by T. L. Mitchell, of Long Island, read.

Everybody conversant with our actual knowledge and the literature on the Hessian Fly, will acknowledge it to be excusable that I took the liberty to again ask Mr. Phillips if by chance the year 1768, together with the name Hessian Fly, was not a clerical error; the more so, as Mr. Morgan, in Dobson's Encyclop. (vol. viii., p. 491), states, "The name of Hessian Fly was gven to this insect by myself and a friend early after its first appearance on Long Island."

I received from Mr. Phillips the following letter, dated April 1, 1884:—

1. 1768 is not an error. It occurs in the proper place in the old MS. vol., and there can be *no doubt* about the fact. *Similiter* the words *Hessian Fly.*

The term came in use in Pennsylvania from the early German immigrants long before the revolution. I am *sure* the term occurs in our Pennsylvania gazettes long prior to that period.

2. Cannot say if that paper (of Dr. Bond) was ever published. Possibly in some gazette *pro bono publico.* There is no clerical error as to the date and name.

Dobson is certainly incorrect in the statement you quote. [Mr. Morgan's pretension to have given the name Hessian Fly. Dr. H. A. H.]

At this writing it is not an easy matter for me to *verify* my own statement as to the communications which I have seen in the early Pennsyl-

vania gazettes before the revolution. I have had great use often in days past for historical researches, and the recurrence of the name of the Hessian Fly in these early days was a frequent matter of conversation with me and friends, friends of two generations older than myself. While I am perfectly convinced that my memory is accurate, yet a statement of that nature should be verified for historical use. I regret I have not the present opportunity of so doing; yet, in view of the minutes of 1768 bearing upon the matter, I don't doubt the accuracy of my memory, although it was *obiter*.

The importance of these letters is an excuse for their publication, which is done with the permission of the writer.*

April 11th, 1884.

The old minutes of the Philosophical Society are now in the way of publication, and as they contain two papers in 1768 about the damage done to wheat by the Hessian Fly, both delivered in the first half of the year, the fly must have been observed in 1767, if not earlier. Dr. Bond's paper, No. 4 of original papers, ordered to be published by the Philosophical Society, has not yet been discovered. Of course the old tradition of the importation by the Hessian troops is now effectually done away with, but some other papers never quoted show that even seventy years ago this tradition had been considered as not acceptable. The President of the Philad. Soc. for Prom. Agr., Mr. Richard Peters, in his Notices for a Young Farmer, etc. (Mem. of the Soc., 1818, vol. iv., p. xxix), says: "Its name (Hessian Fly) does not prove its importation; for that appellation was bestowed during our revolutionary excitements, when everything we disliked was termed Hessian. *In Hesse they have not this vermin to annoy their crops.*" The Vice-President of the same Society, Mr. James Mease, M. D., in his address on the progress of agriculture, Jan. 14, 1817 (ibid. p. lx.) says: "The wheat . . . was much injured by its old enemy, the insect absurdly called Hessian Fly." Mr.

* The proof sheet of the minutes of the Am. Phil. Soc. has, p. 15:—

The Com. for Husbandry reported a paper on the Hessian Fly by Dr. Bond, which was read, and Dr. Bond was requested "to prepare it for the press, that it may be communicated to the public without loss of time." See No. 4 of original papers. Mr. H. Phillips, jr., to whom I am indebted for being able to compare myself the proof sheet, remarks that Dr. Bond was one Dr. Thomas Bond (1712–March 26, 1784), or it may have been Dr. Phineas Bond (1717–1773). Neither was British Consul at Philadelphia.

A. Fitch (Hessian Fly, p. 19) complains that he was unable to find in either of the largest libraries of the State of New York the vol. v. of those Memoirs, and has for the same reason not seen vol. iv. The series in the Harvard Library was procured by the care of Th. W. Harris, but vol. iii. is wanting, as it could not be procured by the Society. Mr. Harris' correspondence is affixed to the first volume, and shows how difficult it was in 1845 to get those Memoirs.

The opinion given by Mr. R. Peters concerning the origin of the name Hessian Fly is corroborated by Mr. Bond's relation upon another insect (Encycl. Britan. p. 494). "This insect," says he, "is called in Maryland the Revolution Fly, by the friends of the British Government; but from all I can learn it is not the same insect which originated on Long Island and is called the Hessian Fly (by way of opprobium) by those who favored the Revolution." Prof. Packard objects, p. 236, that the words, "before the arrival of the troops," in quoting Mr. Mitchell's statement—it (the H. Fly) was first discovered in the year 1776—are my own and not Mr. Mitchell's. If Prof. Packard had compared the Enc. Brit.,—he states that he had not seen it—he would have scarcely objected to my statement. The whole passage by Mitchell is interesting to be quoted in full: "As it (H. Fly) appeared *about* the time that the Hessian troops arrived, an opinion had gone abroad that they brought it along with them; but the Doctor (Mr. Mitchell) was of opinion that it is a native animal, nourished by some indigenous plant, but which then, for the first time, came among the wheat and found it proper food."

As it seems that the article, "Hessian Fly," in the Encycl. Britan., is not so well known as it merits to be, I have taken particular care to find out the editions in which it is contained. It appears first in the third edition, vol. viii., p. 489-495, in 1797, and exactly the same in Dobson's first edition, 1798, vol. viii., p. 489-495.* The only copy of the third edition I was able to find belongs to the Essex Institute in Salem, Mass. The fourth edition is rather rare; I have seen no copy, but Prof. W. B. Nichols has kindly compared a copy in the Brit. Museum; the title, Hessian Fly, in vol. x., 1810, is exactly identical with the third edition, and also with the fifth edition, 1817.

I was not able to see the sixth edition. In the seventh and eighth the article Hessian Fly is wanting, but in the ninth, 1880, appears a new one

* This edition is always quoted by me.

filling one page and a half. I cannot make out by whom the article in the third, fourth and fifth editions is written. It is not only interesting, but important, as it was largely used in the pamphlet printed by the order of the Parliament. I have not extracted the article in the Encyc. Britan., as the Dobson's edition at least is present in every library. But I shall quote in the Parliament pamphlet the letters reprinted or extracted in Encycl. Britan. The Encycl. Perthensis, vol. xi., p. 254-256, has the same article somewhat abridged.

In the three copies of the Brit. Parliamentary papers which I was able to consult, I found in the printed papers of the House of Commons that April 21, 1789, was ordered to be printed a paper entitled "Proceedings of His Majesty's Most Honorable Council, and Information Received Respecting an Insect Supposed to Infest the Wheat of the Territories of the United States of America." But the paper itself seems to be wanting in those three copies. Kirby speaks of a vast amount of material collected by the Council, which filled upwards of 200 octavo pages. As this paper contains several reports by Sir Joseph Banks and others, and as it seems to have been used only in the article of the Encycl. Britan., I was very eager to know something more. Prof. W. R. Nichols, of Boston, was so kind as to make in the British Museum the following index of the contents of this paper :—

This is a 4to pamphlet of 65 pages, and, of course, it would be too expensive a matter to have the whole thing copied without special directions. I will give you, however, a list of everything in the volume, and state just how long each portion is.

Contents of Paper Referred to.

1. Letter from Mr. Bond, Consul at Philadelphia, to the Marquis of Carmarthen, 22nd April, 1788; half page.

2. Letter from Sir Joseph Banks to the Marquis of C., 4th June, 1788; one page.

3. Order in Council forbidding any entry of wheat, etc., etc., 25th June, 1788; half page.

4. Minute of Council, 4th July, 1788; one and a half pages.

5. " " 5th " " " " (Containing statement by Sir Joseph Banks.)

6. Report of Sir Joseph Banks, proposing the mode of making experiment on the American wheat, 6th July, 1788; half page.

7. Order in Council directing the experiment to be made, 8th July, 1788; half page.

8. Further account of the Hessian Fly by Sir Joseph Banks, and a statement of the printed accounts published in America, 8th July, 1788; two pages.

9. Account of wheat imported into England, etc, tables; three pages.

10. " " " Scotland, etc., table; one page.

11. Report of examination of cargoes of wheat from N. Y. (including half page report of Sir J. Banks, 17th July, 1788); two and a third pages.

12. General report of Sir Joseph Banks respecting the Hessian Fly and Flying Weevil, 24th July 1788; three pages.

13. Minute of resolution of the Lords of the Council, not to permit the entry of any wheat which, upon inspection, shall be found to have been infected; but that it might be expedient for government to purchase such cargoes, and Order thereupon, 5th August, 1788; half page.

14. Return from the principal officers of the Customs, etc., etc., 6th August, 1788 (contains 6 line report of Sir J. B.); two pages.

15. Letter from M. Broussonet to His Grace the Duke of Dorset, 3rd September, 1788 (containing Extraits des Registres de la Société Royale d'Agriculture du 28 Aout, 1788; three pages.

16. Letter from Mr. Ewart to the Marquis of Carmarthen, dated Berlin, 9th Aug., 1788; quarter page.

17. Extract of a letter from Sir John Temple to the Marquis of Carmarthen, with four inclosures (letters from America), dated New York, 4th Sept., 1788; six pages.

[This includes a reference to the American Philosophical Transactions published in Philadelphia, in 1771.]

18. Letter from Sir Robert Murray Keith to the Marquis of C., dated Vienna, Oct. 8, 1788; half page.

19. Extract letter from Mr. Walpole to the M. of C., Oct. 23, 1788; two-thirds page.

20. Extract letter from Mr. Mathias to the M. of C. (with two inclosures), dated Hamburgh, 19th Sept., 1788; one and a quarter pages.

21. Letter from Mr. Gibson to the M. of C., dated Dantzig, 29th Oct., 1788; two-thirds page.

22. Letter from Mr. Bond to the M. of C., with its several inclosures, dated Philadelphia, 1st Oct., 1788; fifteen pages.

23. Extract letter from Lord Torrington to the Marq. of C., dated Brussels, July 28, 1788; two and a quarter pages.

24. Letter from Mr. Walpole to the M. of C., with copies of two inclosures, dated Manheim, Feb. 21, 1789; two pages.

25. Extract letter from Mr. Heathcote to the M. of C., with two inclosures, dated Bonn, Feb. 16, 1789; one and a quarter pages.

26. Report of Sir Joseph Banks upon the above correspondence, and information, dated 2nd March, 1789; two and a half pages.

[He refers at the end to the following books: Histoire d'un Insecte qui dévore les grains de l'Angoumois, par MM. Du Hamel & Tillet, Paris, 1762, 12mo.; Memoire sur l'accident que les Blés de la Recolte de cette Anneé ont Eprouvé en Poitou, etc., par MM. Parmentier & Cadet de Vaux, Paris, 1785, 8vo. On Root-worms, by M. Bierkander, published in the Transactions of the Royal Academy of Sciences of Stockholm, 1777. Della Malattie del grano in Erba, del Conte Francesco Ginanni, Pesaro, 1759, 4to. Mezzi per distrugerei Vermi che rodono il grano in Erba, etc., Abbate Bonaventura Corti. Printed in Scelta di Opuscoli interessanti, vol. 34, p. 3.]

27. Letter from Mr. Bond to the Marq. of C., with copy of inclosure, dated Philadelphia, November 3, 1788; one and two-thirds pages.

28. Letter from Mr. Bond to the Marq. of C., dated Philadelphia, Jan. 20, 1789; 1 page.

29. Extract letter from Sir Joseph Temple to the M. of C., with two inclosures, dated New York, Feb. 21, 1789; one and a quarter pages.

30. Extract letter from Mr. Miller to the M. of C., dated Charles Town, 12th Feb., 1789; quarter page.

I have compared with this index the statements given in the Encycl. Britan. (Dobson's Edit. is quoted) and have noted by the single numbers what I believed to be useful for a better understanding.

As of late years (E. B. p. 490) great quantities of wheat were exported from America into Britain, it became an object worthy of the attention of Government to consider how far it was proper to allow of such importation, lest this destructive insect might be brought along with the grain.

No. 1. Mr. Bond* informed that there was a design to export wheat from Philadelphia to England, that the fly had made great depredations,

* This Mr. Bond is not the Dr. Bond quoted before in the minutes of the Amer. Philosoph. Soc. I cannot find out anything more about him.

and that there might be danger of its thus being conveyed across the Atlantic. He added, it was not known where the eggs of the insect were deposited, though it was supposed to be in the grain (p. 490).

Nos. 2, 5, 7 and 8. Sir Joseph Banks mistook at first an insect called the Flying Weevil for the Hessian Fly. But in a little time he corrected his mistake, adding that the danger of importing this insect was much greater than that of the Hessian Fly. He proposed an examination of the corn already brought from America (p. 490).

No. 12. General report of Sir Joseph Banks. None of the grain which was examined showed any signs of the fly; but as some imported in August contained the chrysalis perhaps of the Flying Weevil, the cargo should not be suffered to come into the kingdom (p. 490–491).

No 15. Speaks of two insects infesting the wheat in France. The Royal Soc. of Agriculture remarked that the larva of one of them does not appear to differ from the American insect (the quotation of the Stockholm Memoirs leads to the supposition that this is Oscinis.—Dr. H. A. H.) The mischief which they do to the corn having never been considerable enough to attract the attention of the Government, the Society regrets not being able to say anything particular upon that subject (p. 491).

No. 17. Sir John Temple, at New York, the British Consul-general, gives the statements of Mr. Morgan quoted by A. Fitch (491-492).

No. 22. Mr. Bond gives good information, which is at some length reprinted (p. 492-493).

No. 26. From the whole correspondence on this subject, Sir Joseph Banks drew up a report for the Privy Council, which is also reprinted at some length, together with an appendix dated April 27, 1879 (p. 493-494).

No. 28. Mr. Bond's letter (p. 495).

As much as the Professor has, after the study of the German literature, changed his former opinions and conclusions, he will have to change the remainder of his conclusions after a closer study of the American literature.

"Now if the Hessian Fly (Packard, p. 239) had been indigenous many years before 1776 in the wheat fields of this country, some at least would probably have been carried in loads of grain to England." The discovery in the minutes of the Amer. Philos. Soc. makes this presumption untenable. The same is the case with the following supposition (p. 239): "On the other hand, it may have been imported into the French colonies in Canada from Southern France, by immigrants." But it is well known that the immigrants into the French colonies in Canada came all from the

north-western parts of France. There is nothing known about a trade between Canada and the Mediterranean ports of France; the trade was with the western ports. The first mention of the Hessian Fly in Canada in the chronological table of the Professor is 1805. The troops were sent by the way of Brest. To be sure of the facts I applied to the best authority, Mr. Fr. Parkman, who has kindly confirmed in a note the above given statements.

The fourth conclusion (p. 238) of the Professor reads as follows: "That it (Hess. Fly) has *from time immemorial* been an inhabitant of wheat fields on the shores of the Mediterranean, in Spain, at Toulon in France, at Naples, in Minorca and Asia Minor."

It should have been remarked that the statement *from time immemorial* in Mr. Dana's report applies *only* to Minorca and Spain. Such statements by agriculturists or peasants are to be taken for what they are worth, if not corroborated by reliable published reports. After all it is obvious that this statement states too much. The experience of a century has shown that the Hessian Fly has nowhere been from time immemorial the inhabitant of the same spot.

Concerning France, the letter of Mr. Broussonet (Encycl. Britan. and Parliamentary Report) proves directly that no mischief was done considerable enough to attract the attention of the Government. The specimens collected by Mr. Dana at Toulon are the only ones known from this part of France.

Concerning Italy, I know nothing except the few specimens collected near Naples by Mr. Dana; but I have taken steps to receive direct statements from Italy as well as from Spain. I have not yet been able to compare the two Italian publications quoted in the report of Sir Joseph Banks. The quotation of Asia Minor should have contained that Prof. Loew had not seen the fly, but had collected near the shore a larva and pupa on the straw, later recognized by him as identical with his *Cec. secalina*.

I believe that the value of the Professor's fourth conclusion is rather doubtful after the statements just given, and the value of the fifth conclusion, "that it probably originated in this (Mediterranean) region or farther east, the probable original habitat of the wheat and other cereals," is nothing more than a supposition of B. Wagner. But the statement that these cereals still live wild in Persia is not proved at all, and certainly neither the fly nor any record about any mischief done by it in the Orient has been found.

The sixth conclusion (p. 238) of the Professor is also an adoption of B. Wagner's views: "That it was introduced from Southern Europe, either Southern France or Mediterranean regions, perhaps Asia Minor, before the Revolutionary War." But Wagner speaks with more reserve and caution. Having felt the strength of the objections to an introduction of the insect by a longer voyage, he supposes that importation had been possible only from the nearest coast of France. But his assumption of the long-existing occurrence of the insect in Southern France is not corroborated by any fact whatsoever, beyond the few specimens found in 1834 by Mr. Dana near Toulon. Whether a large trade between the Mediterranean shores and North America existed before the Revolution, or not, I am unable to state. But some very interesting facts out of the memorandum book of his father, communicated by the late Mr. N. Silsbee, show that immediately after the Revolution an active trade from Salem, Mass., to Leghorn and other Italian cities, was kept up, principally bringing over American meal. It may therefore be supposed that this trade was not an entirely new feature, at least it was spoken of as a well known fact. Had not the difficulty, or perhaps better, the impossibility, of introducing the insect by trade been proved by the immense trade during all this time with England, where by the greatest care and attention the insect was never observed in the cargoes, it could have been assumed that the fly had been introduced just by American trade to all the places visited by Mr. Dana. At least there was the same chance for an introduction from Europe to America, as from America to Europe. Nevertheless just this difficulty makes it more plausible that the insect was indigenous here as well as in the Old World, a statement so well expressed a century ago by Dr. Mitchell (Encycl. Britan., p. 494).

The Memoirs of the Philad. Soc. for Promoting Agriculture, contain in Vol. IV., 1818, p. xxix., Notes for a Young Farmer, etc., by Richard Peters, President of the Soc.:

It is not yet agreed what kind of wheats best withstand the Hessian Fly. . . Good farming, manure and reasonably late sowing are certainly the best securities. It is most probably a native here. It never entirely leaves us, though it appears at irregular periods in numbers less scourging than at times when its ravages are more conspicuously destructive. [Here follows the passage concerning its name, as quoted before; and p. lii., a note of Say's description of the fly and its parasites.]

P. xl., Address on the Progress of Agriculture, January 14, 1817, by James Mease, M. D., Vice-President.

Wheat, barley and oats have been as productive as common, except where the first named grain was much injured by its old enemy, the insect absurdly called Hessian Fly; another proof that a cold winter has no influence in destroying that pest.

Further, in communications in consequence of the request of the Society, on the circumstances attending the season of 1816.

P. 200, Joseph Gibbons: Hessian Fly locally in Springfield.

Delaware Co.: Note by R. Peters.

P. 204, Henry Cox, London Grove, Pa.: Hessian Fly undisturbed.

P. 211, Richard J. Jones, Kinnerely, Md.: H. Fly very destructive.

P. 216, R. K. Meade, Virginia: H. Fly present.

[All these data are wanting in the chronological table.]

P. 224-226, a letter by Th. Say containing remarks on the H. Fly.

P. 236-237, a letter by Th. Say containing remarks on the H. Fly.

Vol. V., 1826:

P. 135-137. On the Hessian Fly, by John Linton, April 30, 1821. Description of a simple machine to brush the field with a branch of a tree to destroy the H. Fly.

A note on p. iv. of the contents states: "The implement mentioned by Mr. Linton has not been found to answer the purpose intended by it."

P. 143-153. Some Observations on the Hessian Fly; written in the year 1797 by Dr. Isaac Chapman; read August 14, 1820; at the end a note by Dr. M. (probably Mease).

This paper is one of the most important, based upon personal observations from 1786 to 1797. It has been used by Harris. The note at the end states that after the observations of Mr. Worth, there are certainly three annual generations instead of two, as stated by Mr. Chapman. Chapman's paper should be quoted as belonging to the literature of 1826.

An anonymous article, "The Hessian Fly," in the *Albany Gazette* of June, 1799, is reprinted in the *Agricultural Museum* (by D. Wiley), Georgetown, Ca., 1811, vol. 1, p. 39.

Memoirs of the Board of Agriculture of the St. of New York, Albany, 1821, vol. i., contains:

Featherstonaugh, G. W. An essay on the principles and practice of rural economy; chap. ix., metamorphoses of insects, p. 170, gives a short account of the Hessian Fly, "which has now greatly abated."

P. 62, a letter from Exc. George Washington, Mount Vernon, 15th July, 1797.

Our crop of wheat this year will be very short, owing to three causes, . . . and which is more to be regretted, to what with us is denominated the Hessian Fly, which has spread devastation more or less in all quarters.

[This year is wanting in the chronological table.]

Matth. Carey, *American Museum*, contains many communications and is largely used by A. Fitch. Nearly all authors quoted to 1792 are reprinted in full in the *American Museum*.

A premium was proposed by the Philad. Soc. for Prom. Agriculture for 1788 (Carey, vol. iii., p. 176):

"8. For the best information, the result of actual experience, for preventing damage to crops by insects, especially the Hessian Fly, the Wheat Fly, or Fly Weevil, the Pea Bug, and the Corn Chinch-bug or Fly—a gold medal; a silver medal for the second best."

The same premium was offered for 1789 (Carey, vol. v., p. 159), for 1790 (Carey, vol. vii., p. 271) and for 1791 (Carey, vol. ix, p. 170). But I find nowhere mentioned that the premium was awarded.

The remarkable, not to say extraordinary circumstance, that the excitement during the Revolution led to entire forgetfulness of the former presence of the Hessian Fly, makes it, as I believe, more important to follow up as carefully as possible the literature before and after the Revolution. I will be indeed very much indebted for the communication of every fact not yet recorded.

A. A. A. S.

The next meeting of the A. A. A. S. will be held at Ann Arbor, Mich., commencing Aug. 26th, 1885. The Entomological Club will meet at that place on August 25th, 1885, according to its by-laws; exact locality not yet determined.

Will those members of the Club, or other Entomologists, who expect to be present, please notify one of the undersigned, and also send in the title of any papers they expect to read, and state the length of time they expect to occupy, so that a programme can be arranged? The exact place and hour of meeting, as well as the programme so far as fixed, will be published later.

Committee: John B. Smith, Brooklyn, N. Y., Chairman; Herbert Osborn, Ames, Ia.; B. Pickman Mann, Washington, D. C.

NEW LIST OF THE NORTH AMERICAN DAGGER MOTHS.

BY AUG. R. GROTE, A. M., BREMEN, GERMANY.

The name "Dagger Moths" is given to a group of white and gray Noctuidæ, or Owlet Moths, which, in the perfect state, possess a certain similarity in appearance, but are often quite dissimilar as caterpillars, not only among themselves, but as compared with the other Noctuidæ, with which Family they are classified. The name itself alludes to a black mark which many of the species show near the internal angle of the fore wings, which resembles a dagger, or the Greek letter *Psi*. The caterpillars are often ornamented with curious hairs or bristles; several are shaggy in appearance, so that they look like *Arctiadæ* or *Dasychiræ*. This peculiarity is shared, however, by other genera such as *Platycerura* and *Charadra*, which I classify with them as a subordinate Group of the Noctuidæ under the name of *Bombycoidæ*, or perhaps more properly, *Apatelinæ*.

The use of the generic name *Apatela* is sanctioned by Stephens, in every way a most excellent authority in this group of moths. It is first used by Hübner in his Tentamen, with the type *Auricoma*, and in a strict sense it must be retained for that section of the genus to which this species belongs. I refer to the Preface of the first part of my first Check List of the Noctuidæ for the grounds on which I use certain of Hübner's generic names. Also to a recent article of mine in "Papilio," wherein I show under what limitations I am now constrained to admit the validity of this author's generic titles. Harris uses *Apatela* for his species *Americana*, but this is not strictly congeneric with *Auricoma*, but falls under a distinct section which I have called *Megacronycta*. As a whole, the Dagger Moths have simple antennæ, the palpi are short with small third article and shortly haired. The eyes are naked; the body usually untufted on the dorsum; the legs unarmed. The hairy larvæ, somewhat arctiiform, construct a rather tough cocoon and usually appear in the spring as moths. Some species appear to be double brooded, others only so in the South. The limits of the genus are perhaps really overstepped in the case of the Californian species referred to the section *Merolonche*, and perhaps again with regard to the Eastern *Oblinita* and allies, the section *Eulonche*. Almost all of the writers who have written on our moths have given more or less attention to this interesting genus. Mr. Saunders was the first to

discover the larva of *occidentalis;* under the name of *Populi* Prof. Riley has given us a description and drawing of the larva of *lepusculina;* but perhaps more work with the best results has been performed by Mr. Roland Thaxter, who has proved himself a most conscientious student and kind personal friend to me. The present list supplements my former lists, the last of which is contained in "Papilio," and corrects certain inaccuracies which crept into them.

Genus APATELA Hübn.

Subgenus *Triaena* Hübn.

Type: A. Psi.

1. Occidentalis *G. & R.* "Western Dagger." Larva on apple and elm, (Saunders, Thaxter).
2. Morula *G. & R.* "Ochre Dagger." Larva on apple and elm, (Thaxter).
3. Lobeliæ *Guen.* "Large Dagger." Larva on burr oak, (Coquillet).
4. Hasta *Guen.* "Smoky Dagger."
5. Furcifera *Guen.* "Forked Dagger." Larva on wild cherry, (Thaxter).
6. Thoracica *Gr.*
7. Dentata *Gr.*
8. Grisea *Walk.* "Pale Dagger."
   Pudorata Morr.
9. Tritona *Hübn.* "Brown Dagger."
10. Falcula *Gr.* "Edged Dagger." Larva on hazel, (Coquillet).
11. Parallela *Gr.*

§

12. Albarufa *Gr.* "Red and White Dagger."
    Walkeri And.

§

13. Paupercula *Gr.* "Small Dagger."
14. Vinnula *Gr.* "Olive Dagger." Larva on elm, (Thaxter).

§

15. Quadrata *Gr.* "Square Dagger." Larva (Dodge).
16. Clarescens *Guen.* "Clear Dagger." Larva on wild cherry, apple, (Thaxter).
17. Harveyana *Gr.* "Harvey's Dagger."
18. Radcliffei *Harvey.* "Radcliffe's Dagger." Larva on wild cherry, apple, (Thaxter).
19. Tota *Gr.*

Subgenus *Acronicta* Ochs.

Type: A. Leporina.

20. Lepusculina *Guen.* "Poplar Dagger." Larva on poplar, (Riley).
Populi Riley.
21. Felina *Gr.* (an sp. præc.?) Larva on poplar, (Edwards).
22. Vulpina *Gr.* "Birch Dagger." Larva on birch, (Thaxter).
§
23. Innotata *Guen.* "Graef's Dagger."
Graefii Gr.

Subgenus *Megacronycta* Gr.

Type: A. Americana.

24. Americana *Harris.* "American Dagger." Larva on oak, (Coquillet); also on maple, walnut, ash (Thaxter).
25. Dactylina *Gr.* "Fingered Dagger." Larva on alder and willow, (Thaxter).
26. Insita *Walk.*

Subgenus *Merolonche* Gr.

Type: A. Spinea.

27. Spinea *Gr.* "Spiny Dagger." Larva (Edwards).
28. Lupini *Gr.* "Lupin Dagger." Larva (Edwards).

Subgenus *Apatela* Hübn.

Type: A. Auricoma.

29. Brumosa *Guen.* "Verrill's Dagger." Larva on birch, willow, poplar, (Thaxter).
Verrillii Gr.
Fasciata Walk.
Impressa Walk.
30. Distans *Gr.*
31. Rubricoma *Guen.* "Red Dagger."
32. Luteicoma *Guen.* MS. Gr. "Plain Dagger." Larva on linden, ash, maple, cherry, apple, etc. (Thaxter).
33. Subochrea *Gr.* "Bright Dagger."
34. Perdita *Gr.*
35. Afflicta *Gr.* "Dark Dagger." Larva on oak, (Thaxter).
36. Noctivaga *Gr.* "Black Dagger." Larva on poplar, (Thaxter).
37. Superans *Guen.* Larva on plum and hazel, (Saunders).
38. Connecta *Gr.*

Subgenus *Jocheaera* Hübn.

Type: A. Alni.

39. Funeralis *G. & R.* "Odd Dagger." Larva on hickory, (Thaxter).

Subgenus *Lepitoreuma* Gr.

Type: A. Hamamelis.

40. Ovata *Gr.* "Oval Dagger."
41. Exilis *Gr.*
42. Hamamelis *Guen.* "Hazel Dagger." Larva on chestnut, oak, (Goodell, Thaxter).
43. Haesitata *Gr.*
44. Increta *Morr.*
45. Dissecta *G. & R.* "Frail Dagger." The flimsiest, smallest species.

Subgenus *Arctomyscis* Hübn.

Type: A. Euphrasiæ.

46. Sperata *Gr.*

Subgenus *Mastiphanes* Gr.

Type: A. Xyliniformis.

47. Xyliniformis *Guen.* "Sleepy Dagger." Larva on birch, blackberry, (Thaxter).
48. Pallidicoma *Gr.*
49. Extricata *Gr.*
50. Edolata *Gr.*
51. Lithospila *Gr.* "Streaked Dagger."

Subgenus *Eulonche* Gr.

Type: A. Oblinita.

52. Oblinita *A. & S.* "Smeared Dagger." Larva on button bush, etc. (Thaxter). Strawberry, poplar, (Saunders).
53. Lanceolaria *Gr.* "Pointed Dagger." Larva on plantain, etc. (Thaxter).
54. Insolita *Gr.* "Rare Dagger."

Desiderata.

A. Spinigera *Guen.*
A. Telum *Guen.*
A. Interrupta *Guen.*
A. Longa *Guen.*
A. Ulmi *Harr.* Corr.
A. Pruni *Harr.* Corr.
A. Salicis *Harr.* Corr.

A. Aceris *Abb. & Sm.*

A. Hastulifera *Abb. & Sm.*

These species have not been identified satisfactorily by me. Harris' species are posthumous and founded on the larvæ alone. They cannot in any event disturb the synonymy of species described before Mr. Scudder's publication of Harris' Entomological Correspondence. For Abbot & Smith's *Aceris* the name *Acericola* has been proposed by Gueneé. If *Aceris* A. & S. is *Americana*, which I doubt, then both *Aceris* and *Acericola* fall away before *Americana* of Harris. The North American species of *Apatela* outnumber the European in the proportion of three to one.

DESCRIPTION OF MATURE LARVA AND CHRYSALIS OF NISONIADES ICELUS, Lintner.

BY W. H. EDWARDS, COALBURGH, W. VA.

On 20th June, 1884, I found on edge of leaf of an Aspen, P. tremuloides, a young larva of species of Nisoniades unknown. A small bit of the leaf was cut on two sides perpendicular to the edge, folded over and stitched down. At a little distance from this shelter a hole was eaten in the leaf. Two days later the hole was enlarged and the larva evidently had left its nest and returned to it after feeding. On 27th June one moult was passed, supposed to be the first; on 5th July a second; on 16th July a third. This was the last moult, but I am not sure that one did not take place between the 5th and 16th. It is probable there were four moults, as *N. Lucilius* is reported by Prof. Lintner to moult four times. The larva was kept in a jelly glass, and being always concealed in a leaf, a moult might have escaped me. On 20th July, or 4 days after last moult, the description was as follows:—

MATURE LARVA.—Length $\frac{6}{10}$, greatest breadth (in middle) $\frac{1}{10}$ inch; obese, tapering either way from middle, the dorsum elevated and sloping towards 2 and 13 about equally; color gray-green, caused by fine whitish granulations on a pale green surface; over all the dorsal region a yellowish tint; a mid-dorsal dark line from 4 to 12; a sub-dorsal white stripe on either side; no other markings; segment 2 yellow (no black on this segment); whole upper surface covered by a fine gray down; head sub-cordate, deeply depressed, broader than high; color all light red-brown; the surface granulated, and covered with a fine down; the ocelli red-brown on a black demi-stripe.

On 30th July, the length was $\frac{75}{100}$, breadth $\frac{15}{100}$ inch; but excepting in increased stoutness, the appearance was just as described.

Before 30th July this larva had stopped feeding, and I expected pupation daily. But after a week or two of this, it seemed probable hibernation had set in, and I placed it in the cellar. At intervals I examined it and found it had not moved. On 19th Sept. I sent this larva with many others to Clifton Springs, New York, to be placed in the "cooler" of the Sanitarium, where the temp. all the year is kept at about 40° Fahr.

On 7th March, 1885, I received all the larvæ from Clifton. The Nisoniades was in a small paper box, and after it had left me (19th Sept.) it had stitched the paper cone it rested in by one end to the side of the box. The cone was laid loosely in the box when I sent it away, and came back fastened to the side, showing that at some time the larva had been sufficiently active to make its nest secure. This larva eat nothing after hibernation, and there was no evidence that it ever left its cone, but as I had frequently to break the threads that closed the cone in order to keep watch on the inhabitant, and always found the edges closed again, it was evident that the larva was not always soundly sleeping. On night of 27–28 April pupation took place.

DESCRIPTION OF CHRYSALIS.—Length $\frac{35}{100}$ inch; breadth across mesonotum $\frac{14}{100}$, across abdomen $\frac{16}{100}$ inch; cylindrical, the abdomen conical; head case produced, rounded, and bent down, i. e., towards ventral side; mesonotum broad, rather high, rounded, not carinated; followed by a shallow excavation which is continued across the wing cases; surface smooth; color of head case reddish-brown; of wing cases less red, more brown, with a greenish tint; of mesonotum more yellow; of abdomen pale flesh color; the cremaster straight, small and short, fastened to support by a tuft of white silk; the surface of this chrysalis is covered by a fine short down, and about the head case are scattered short hairs.

The imago came forth 13th May, *N. Icelus*. To make sure of the species, I submitted it to Prof. Lintner. The description of the mature larva will answer as to color and markings for all the stages after first moult. The Aspen was brought from the Catskill Mts. I have formerly in one instance had the same larva here from English Filbert, but the imago failed to appear.

Very little seems to be known of the preparatory stages of the American species of this genus. Prof. Fernald says, But. Maine, of *N. Brizo*, "The

larva is said to feed on oak and Cynoglossum Morisoni." Of *Persius*, "The larva, according to Scudder, feeds on willow, poplar and Lespedeza capitata." Of *Icelus*, "The early stages of this common species are not known." Mr. Scudder gives the food plants of three species, in "Butterflies." On p. 114 we read: "The caterpillars hibernate full fed, and only change to chrysalis as winter's icy bonds begin to break," and on same page is given a cut of larva and chrysalis of *N. Ennius*, a species unknown to me, and so far as I am aware, undescribed. Dr. Harris describes the caterpillar of *Juvenalis* as if he had seen it, but the chrysalis from one of Abbot's figures, and says: "Mr. Abbot informs us that in summer the skipper leaves the chrysalis in nine days, but the autumnal brood continues in the chrysalis state throughout the winter." For *Brizo*, he refers to Boisduval and LeConte's figures of caterpillar and chrysalis, and these are copied after Abbot. Abbot says of *Juvenalis*: "One of them spun itself up July 26th, changed 27th, and came out Aug. 5th. Some that enclosed themselves in Sept. and Oct. did not come out till the 22nd of March following." Abbot, in Ins. Ga., figures no Nisoniades but *Juvenalis*. His larvæ behaved very differently from this of *Icelus*, or from the account given by Mr. Scudder. By the time *Icelus* was hibernating, the *Juvenalis* had pupated, and the late brood, Sept. and Oct., Abbot says, pupated and passed the winter in chrysalis.

The only satisfactory description of a Nisoniades caterpillar published is that of *Lucilius* by Prof. Lintner, Ent. Cont., 4, 67. He in fact describes all stages, egg, four moults and chrysalis. His larva fed on Aquilegia Canadensis, pupated 6th August, and the imago came out 12th August. Two other larvæ pupated 8th and 9th August, and both gave butterflies on 15th of same month. Mr. Lintner says that there are two annual broods of the butterfly, and possibly a third. So far as I know, the references to the life-history of our Nisoniades above given embrace everything that has been published.

The behavior of *Icelus* is therefore peculiar to itself so far as anything is known of the genus in this country; the larva going into lethargy so early in the season, the last of July, and that when fully mature and when pupation might naturally be expected; spending eight months in that condition, eating nothing in the spring, but pupating several weeks after mild weather had come. There might have been an earlier brood than the one of July, but probably there was no later one, and the two, if there be two, must be the limit.

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ENTOMOLOGICAL EXHIBITS AT THE NEW ORLEANS EXPOSITION.

BY THE EDITOR.

The United States Government exhibit, and those of several of the States, at the New Orleans Exposition, included many features of interest to the Entomologist. The Entomological Bureau of the Department of Agriculture had a very fine display illustrating Economic Entomology, which was brought together and arranged under the direction of Prof. Riley, and was not only interesting, but very instructive.

The first thing that caught the eye of the visitor on entering this section was a series of large diagrams on cotton, illustrating the life history of a number of injurious insects, such as the Plum Curculio, *Conotrachelus nenuphar*, and its parasites; the Chinch Bug, *Micropus leucopterus;* the Jumping Sumach Beetle, *Blepharida rhois;* the Boll Worm, *Heliothis armigera;* the Round-headed and Flat-headed Apple-tree Borers, *Saperda candida* and *Chrysobothris femorata;* the Codling Moth, *Carpocapsa pomonella;* the Peach Borer, *Aegeria exitiosa;* the Grape Phylloxera, *Phylloxera vastatrix*, and a large number of other well-known injurious species. The insects themselves were arranged in cases near by, and grouped so as to show those injurious to the apple, pear, peach, orange, strawberry, raspberry, currant, gooseberry, melon, cranberry, persimmon, grape, sugar cane, hop, rice, Indian corn, small grains, cotton, grass, clover, pea, bean, cabbage, potato, tomato, tobacco, asparagus and onion. Many of these groups were very complete, having along with the perfect insects the pupæ and blown larvæ, with specimens of the articles injured, also the friendly insects which aid in subduing those which are injurious.

There was a very interesting section relating to bees and bee-culture, including all sorts of hives and apparatus, specimens of the different races of bees, with dried specimens of the plants and flowers from which honey is chiefly extracted.

A large department was filled with every kind of spray apparatus for

applying liquid poisons to growing crops for the purpose of destroying injurious insects.

The silk exhibit was also very instructive, showing this substance in all stages of manufacture from various species of silk worms, including some of our natives.

A very complete catalogue of the exhibit had been prepared, covering 95 pages 8vo., which was freely distributed to those specially interested in the subject.

In the Florida exhibit there was one case of insects containing a number of butterflies and beetles, including some beautiful Papilios, the only familiar species being *cresphontes*. There were no names to the specimens, and nothing to indicate who they were collected by.

North Carolina shows four cases of insects without names, including some very handsome species of Lepidoptera, Coleoptera and Neuroptera.

In the Texas department there was a gorgeous display, the collection of L. Heiligbrodt, of Bastrop, Bastrop Co., Texas, consisting of twelve cases of Coleoptera and twelve of Lepidoptera, classified and named, including some of the most brilliant and perfect specimens ever seen by the writer, with wonderful metallic lustre. Mr. H. also exhibited forty-three cases of European insects.

The State of Mississippi shows one case of insects fancifully arranged, collected by Miss P. Crump, including all orders, among them some rare and interesting butterflies.

In the Maryland exhibit, Mr. E. Louis Graf, of Baltimore, has a very singular looking display consisting of several cases of insects with the specimens arranged in fanciful designs and representing objects such as the American eagle, etc.

In the woman's department there was a collection of galls by Miss Cora H. Clarke, of Boston, in eight cases; also a series of excellent drawings of insects and parts of insects by Mrs. A. B. Comstock.

Among the exhibits from Japan there were quite a number of insects shown by the educational department, consisting of four cases of Lepidoptera, including some very beautiful diurnals and handsome moths. The only familiar butterfly here was that cosmopolitan species, the Painted Lady, *Pyrameis cardui*. There were two cases also of Coleoptera, containing some handsome longicorns, one case each of Neuroptera, Hemiptera and Orthoptera, and one of mixed Hymenoptera and Diptera.

In addition to these there were two large cases where the specimens

were grouped so as to show those injurious and those beneficial to agriculture.

There were probably other collections of insects in the buildings, but there being no official catalogue to guide the visitor, there was great difficulty in finding them.

REMARKS ON SOME SPECIES OF COLEOPTERA, WITH SUPPLEMENTARY DESCRIPTIONS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Many of the species of Coleoptera have been described from single, or, at the most, two or three specimens; these often imperfect, immature, or with individual peculiarities. Owing to this, those who undertake to determine their insects by descriptions, even allowing a wide latitude of interpretation, are frequently in doubt and uncertainty. Where families and genera have passed through recent monographic review, the re-description of the species from better preserved or more abundant material usually obviates the difficulty, but enough still remain to give trouble.

Among these, the ones here introduced seem deserving of notice, as some further description is necessary for their identification without having recourse to friendly aid.

Toxotus Schaumii Lec. The first difficulty is the feebleness of an important generic character; to be a Toxotus the eyes must be emarginate, and they are so obsoletely so in the few individuals of this species that have come under my observation as to make this character opinionative. There are two forms of this species so unlike in color, that unless taken in close relation, they would scarcely be recognized as belonging to the same species.

When Dr. LeConte described this species (Jour. Acad. Nat. Sci., Phil., 2d series, vol. 1, p. 320), he seems to have only known one of these forms, characterizing it as "black, with whitish pubescence, legs black, femora yellowish, with base and tip black." This seems to apply to both sexes. And if the specimen in hand is of this color and recognized as a Toxotus, there is no further trouble. But should the specimen be reddish yellow, with black elytra so closely clothed with whitish grey pubescence as to conceal the color, antennæ black, with yellow basal joint, and tarsi piceous,

the diagnosis might be incorrect and induce the collector, were he ambitious in that direction, to add another synonym.

It is true, Dr. LeConte mentions, in a two-line notice, that this is a male form (Proc. Acad. Nat. Sci., 1862, p. 41); but, as the volume is not indexed, unless stumbled on accidentally the reference would escape notice. This appears to be a rare Cerambyan, and among the choicer. The specimen taken here was of the last mentioned form, being in length 1.20 inch. Heretofore it seems to have occurred only in Ohio, (LeConte, Dury).

Leptura vibex Newm. A color variety of this caused me some trouble, notice of which, if any, has escaped my attention. Dr. Horn described the species under the name *nitidicollis*, giving a fine colored figure (Proc. Acad. Nat. Sci., Phil., 1860, p. 570 and plate 8). Normally it is black, with the mouth parts and a narrow marginal and medium stripe (subject to variation) yellowish; legs rufous; femora with the distal end black, or not. This describes the form found here. The other form previously alluded to corresponds also with this description, except that the thorax is entirely yellow. I took it in Ohio, forty miles westward from here, but did not find the other form there, so that perhaps it is a local race. The species appears to be distributed from Northern Michigan through Canada and southward to Virginia. The variation in the extent of the elytral stripes is considerable; in some individuals the marginal one is obsolete and the dorsal reduced to a mere line; in others they are dilated so as to leave only a narrow sutural and lateral stripe black; and some may possibly be found with the elytra entirely black, or entirely yellow.

Rhinoncus longulus Lec. is common and very abundant, occurring from Florida to Michigan, and also in California (LeConte.) Here it feeds exclusively on Polygonum virginicum Lin., a plant growing in open woodlands, the leaves of which it perforates. Its season of greatest abundance is late in June, but it may be found sparingly till September. Though so common, it does not seem to be well recognized, no insect being oftener given in exchange. This is probably because the description (Rhyncoph. N. A., p. 284) only applies to rubbed or alcoholic specimens, omitting much of the vestiture as met with in life. In addition to Dr. LeConte's description—"thinly clothed with small white scales; more dense, forming a short posterior-dorsal line on the prothorax, and an elongate sutural spot at the base of the elytra"—there is also an elon-

gate sutural spot extending from the middle till near the apex, the anterior and posterior extremities of which are more or less connected with arcuate transverse lines extending to the margin, enclosing on each elytron a black spot nearly destitute of white scales; the humeri are also similarly encircled; the sides of the thorax and abdomen are likewise moderately densely clothed with white scales; the striæ are deep, wide and coarsely punctured, with narrow rugose intervals. When first taken the insect has a very pruinose appearance, but rough handling or immersion in alcohol removes nearly all the scales, except the basal spot.

Piazorhinus pictus Lec. is not very common. I have taken three specimens and have seen three others. It probably lives on Ostrya Virginica (known here as Iron-wood). It is excessively variable in the color and ornamentation of its vestiture, no two of the six examples being alike, and only one of them approximating that of the type. Dr. LeConte described the species (Monograph Rhyncoph.) from a single insect taken in Georgia, as "Testaceous, clothed with pale yellowish pubescence; head and beak dusky. Elytra with a large, rounded, common, dusky spot, extending from the base to the middle, paler within; and a dusky, oblique band more or less interrupted on the seventh interspace, which attains the suture about one-fourth from the tip." Of those I have seen, one has the beak and head leonine yellow, like the thorax; the elytra being of the same color, mottled uniformly with brown; another has the beak, head and thorax typical, but the elytra are dusky brown with a streak along the external margins and an irregular fascia near the apex, tawny yellow; another has the beak and head typical, but the thorax has a dark spot in front of the scutellum and there is a small dark spot on each elytron near the middle. The others are still differently ornamented and need not be described, as the above shows sufficiently the variableness of the species in this respect. This species is likely to prove difficult for the collector to determine so long as he has the description of only one insect to refer to, and perhaps only about one in ten of his insects agreeing with it. This is one of the many cases that goes to show that, unless to meet urgent systematic requirements, it would give better results and prevent much confusion to await the accumulation of several specimens before attempting to describe a species.

Among the errors that have become widespread in exchanges it may be of advantage to notice the following:

Microclytus gazellula Hald. has lately appeared on several exchange

lists, but in every instance (four) the specimens sent me were *Cyrtophorus verrucosus* Oliv. The descriptions of *C. gazellula* Hald. and of *Cyrtophorus gibbulus* Lec. (Lake Sup. p. 234 now united with it), show the color and markings to vary greatly individually, and to so closely approximate *C. verrucosus* as to be doubtfully distinguishable, and the separation must be made by reference to generic characters. In *Microclytus* the second joint of the antennæ is as long as the fourth; while in *Cyrtophorus* the second joint is short, and the third is longer than the fourth, (Class. Coleopt.) No weight should be attached to color or markings for the separation of these two species.

Anthonomus cratægi Walsh, which is common and abundant on many kinds of blossoms, especially wild cherry and laurel, is always sent me for *A. rubidus* Lec., which species I have not yet obtained. There should not be much trouble in distinguishing them, as *cratægi* has only six joints in the funicle of the antenna, while *rubidus* has seven—a matter readily determined by counting them under a microscope.

Elater protervus Lec. has been united with *semicinctus* Rand. and *Cryptobium latebricola* Nord. with *pallipes* Grav., both of which have always been troublesome to collectors.

There are many other names on the list that deserve the same treatment, and will, no doubt, eventually be united as the variations in color, size and sculpture within specific limits become better known.

SEASIDE CAPTURES.

BY FREDERICK CLARKSON, NEW YORK CITY.

I visited Fire Island, Rockaway Beach, Long Beach and Coney Island during the seasons of 1883 and 1884. Found myriads of *Cicindela hirticollis* and *dorsalis*, Say. The beaches were fairly alive with these beetles. The *hirticollis* were most abundant in the latter part of June and early part of July, and *dorsalis* at the end of July and beginning of August. These beetles may be found throughout the length of these beaches. They have a singular habit of collecting in great numbers at certain points, where in spaces of about fifty feet square they are as numerous as flies about a stable. This was frequently observed, and so far as the general character of the beach and the surroundings were con-

cerned there was nothing to favor the particular locality. My activity and success in taking these interesting hexapods at the seaside excited on many occasions the curiosity of some equally interesting bipeds, who, barefooted and wading through the surf, doubtless ridiculed my energy and thought me mad.

> "Let Hercules himself do what he may,
> The cat will mew, the dog will have his day."

At the last of spring and in the early summer, *Calosoma scrutator* Fabr. can be found at these beaches. The past seasons, however, gave me but few specimens. *Doryphora decem-lineata* lined the shore during both summers, having been developed in great numbers in the many potato fields of this island-garden of New York. *Catalpa lanigera* Linn. and *P. humeralis* Fabr. were found during the month of June among the sea weed; the former readily discovered by its brilliant coloring of green and yellow, and the latter by its scarlet spot in a setting of dull blue. A wrecked *bark* furnished me with good specimens of *Necrophorus Americanus* Oliv. and other genera of the Silphidæ family, together with an occasional unpleasant reminder of the dog that had had his day. Of the tribe Cetoniini only a few specimens were obtained; *Euryomia fulgida* in June, *Allhorina nitida* in July, and *E. inda* at the last of summer. *Harpalus caliginosus* Say was captured in September hid away in the drift at the tide mark. Of this species I would note here the suddenness of its appearance in Columbia county, this State, in the autumn of 1882. In the early part of September I found a single specimen under a stone. On the 13th, a dark and misty day, I captured twenty, and could have taken hundreds feeding upon the seed tops of a common weed, *Ambrosia artemisiæfolia.* The day before and for several days thereafter until the 27th, when I returned to town, only an occasional one was seen. Among the treasures of the beach I collected several shells, perforated in every part by the young of one of the lower order of Crustaceans, and rendered immaculate by the washings of the tide and the sun's rays. The minute winding galleries, not larger than pin holes, displayed exquisite workmanship, resembling the most delicate lace. The mouth parts of these Sea Worms, or Barnacles, are strong and corneous, and are capable of excavating galleries in the hardest substances. I have in my collection a portion of a slab of white Italian marble, recovered in 1878 from the wreck of the ship Grecian, from Leghorn, that foundered off the coast of Long Island

twenty years previous. The specimen measures four by six inches, has a thickness of one inch, and is so thoroughly honeycombed by these Crustaceans as to have reduced its original weight nearly one-half.

MISCELLANEOUS NOTES ON BUTTERFLIES, HABITS OF LARVÆ, ETC.

BY W. H. EDWARDS, COALBURGH, W. VA.

MELITÆA HARRISII, Scud.

I described the stages of this species in CAN. ENT., ix., 165, 1877. In fall of 1883, I received several larvæ from Mr. Chas. Fish, of Brunswick, Me., which were carried through the winter in ice house. They were brought into a warm room 29th April, 1884, and 1st May, began to feed, the plant being wild Aster. On 4th May, some were passing the fourth moult, and these reached fifth moult 10th May. The first larva suspended 17th, pupated 18th, and the imago appeared eight days thereafter, or on 26th May. All the larval stages, however, were irregular. One larva passed fifth moult 19th May, but did not pupate till 1st June. On 7th June, '84, I received from Mr. Fish about 20 larvæ in last two stages, and on 9th about 50 more. Some were in third stage from pupa, or between 2nd and 3rd moult. The species evidently hibernates after both 2nd and 3rd moult, as *M. Phaeton* does. Mr. Fish wrote that all were taken on Dipoplappus, and says: "I found them sometimes 4 or 5 on a plant, always on the upper side of the leaf in the most conspicuous position. I have never found them making any attempt at concealment." Prof. Fernald also says, But. Maine, that they make no web over their food-plant.

MELITAEA PHAETON, Drury.

I related in Papilio, iv., 69, 1884, how *Phaeton* had come to be exterminated in this region, by reason of a flood in the Kanawha River, in 1878, which covered the river bottoms to a depth of several feet in many places, and especially in the swamp where I formerly used to find the larvæ, as related in But. N. A., Vol. II. The swamp was under ten feet of water for two days after the larvæ had closed their webs for hibernation, in August. For several years I had seen neither larva nor butterfly. I had near my house, on high ground, a plant of Chelone glabra, which

years before had been brought from this swamp in order to have food convenient when I might have larvæ of *Phaeton*, and 25th June, 1883, a knot of twisted leaf enclosing eggs of *Phaeton* was found on this plant. Some straying butterfly had found the plant and laid a large cluster of eggs on it. The larvæ from these were carried through the winter, about 60 of them, and I determined to re-people the swamp. On 29th April, '84, I had searched it for larvæ, but found none. On 22nd May thereafter, I turned loose 2 ♂ 6 ♀, and 1st June, 12 ♂ 3 ♀. On 17th July, I visited the swamp again and soon found five webs, with hundreds of caterpillars. Mr. C. Troxley, of Louisville, Ky., wrote me that he had taken *Phaeton* feeding on Mimulus ringens, a plant not before recorded. Miss E. L. Morton, of Newburgh, N. Y., has fed the larvæ in confinement on the narrow-leaved Plantain. The other plants known are Chelone glabra, Gerardia pediculata, Lonicera ciliata and Viburnum dentatum.

Colias Eurydice, Bois.

I raised a brood of larvæ of this species in 1884, from eggs sent by Mr. W. G. Wright, San Bernardino, on Amorpha Californica. I have several of these plants growing in my garden, sent by Mr. Wright, and by covering them in winter, or moving them to the cellar, they do well here. I described the stages of *Eurydice* in Can. Ent., xv., 224, 1883, and then stated that there was no generic difference between the larva, eggs or chrysalis of this species and *Philodice*, belonging to Group 2. There seemed however to be a difference in the food-plants of the two groups, *Philodice* and *Eurytheme* feeding on Clover and Astragalus, the other on a shrub. But I separated part of the *Eurydice* larvæ in '84, giving them white clover, and though they at first seemed unwilling to eat it, they did become used to it and went to pupation on it.

The *Eurydice* butterflies that I have had or have received from Southern California are nearly all quite different from those taken about San Francisco, inasmuch as the disk to base of fore wing is not violet-pink, but yellow. Some have a little changeable lustre, but most have simple yellow.

Victorina Stelenes, Linn.

I have recently received a fine male of this species, taken March, 1885, at Indian River, Fla., by Dr. W. Wittfeld. A few weeks later another was seen, but flying high, and out of reach. These are the only

examples Dr. Wittfeld has seen since he has collected butterflies, that is, in course of five or six years. *Stelenes* is Cuban, according to Gundlach's list, Papilio, vol. i., p. 112. It is also credited to Jamaica by Chenu—perhaps on authority of Doubleday's Genera, which I have not at hand to refer to; though Gosse in his Naturalist in Jamaica does not mention it. It is found on the Continent from Mexico to Brazil. In my Synopsis, 1872, I credited this species to New Mexico, but on what authority I quite forget. At any rate, it was erroneous. Nor has it been taken in S. W. Texas, as Strecker's Cat., 1878, says. In my Cat., 1877, I rejected the species for want of authentication. Its capture in Florida is the first instance known to me of its having been taken in the U. S. The species is very showy, expanding nearly 4 inches. Color pale brown, or blackish-brown, with a broad belt common to both wings of yellow green, and with submarginal green spots. Victorina ranks between the genera Timetes and Diadema. Dr. Wittfeld has at Indian River, at one time or other, taken three species of Cuban butterflies in single instances, viz., Papilio *Polydamas*, Diadema *Misippus*, and *V. Stelenes*.

LYCAENA PSEUDARGIOLUS Bois.

Spring form, PSEUDARGIOLUS.

In But. N. A., vol. 2, I stated that this form of the species must reproduce itself in May of the next year; the chrysalids "probably produce butterflies in small numbers in July and later, but most of them hibernate, and give *Pseudargiolus* (form) the following May, or earlier"; and I said that I had never yet succeeded in getting a chrysalis completely through the winter. Some time in the winter, when the butterflies (in the house) were ready to emerge, the shell of the chrysalis proved too hard for them to force it open, and they died prisoners, but with full color and markings of *Pseudargiolus* in the wings. Observations in the field, as I related at length, supported the view I had taken as to this form of the species.

In May and June, 1884, I had got together 28 chrysalids of form *Pseudargiolus*. In July, I buried them under rocks in the forest, in a shallow box filled with leaf mould—first scalded to kill eggs or larvæ of depredating insects—the upper and under side of the box being covered with fine wire gauze. This seemed to be as near as possible to the natural conditions, consistent with protection against marauders, as I could get. On 27th October, I opened the box, and found 26 chrysalids apparently alive (as they had on trial perceptible weight), and two

crumpled butterflies, form *Neglecta*. The box was then returned to its hiding place. On 26th March, '85, I brought the box to the house, the day being warm and spring-like. In ordinary years spring is fully opened by end of March—fruit trees in blossom. I found several of the chrysalids dead, changed in color to yellowish-brown, and light in weight. But others had weight and were of good color. There were no indications of the wing markings through the shells. Lest the warmth of the house should dry the chrysalids, they were placed on a shelf outside, shaded from the sun. For several days thereafter cold weather, frequently with snow, prevailed, but about middle of April pleasant days came again. On 18th, I saw the first *L. Violacea* on the wing, and I then looked at the chrysalids Several showed the black margins of female through the wing covers, and I expected the butterflies to emerge forthwith. But as none came, two days later I brought in the box and examined the chrysalids one by one. None of them now had any perceptible weight. On opening the shells, one after another, the butterfly was dead, but with full color of form *Pseudargiolus*, wherever there was any color at all. The bodies were exhausted of fluids and flattened, but were flexible, and the wings were not dry, but could be readily separated. One live butterfly only appeared, and on removal of the shell, it crawled up a bit of cloth on side of the box. But the wings did not expand and the insect soon died. Its body was as thin as the others, and plainly it would have quickly died in the chrysalis. It had not the strength to break out, and the shell, and all the shells, were hard. There was no example in these butterflies of form *Violacea*. The experiment was satisfactory, though I would have been glad of the perfect butterflies. As stated in But. N. A., *Violacea*, the earliest of these forms, originates *Neglecta* of July, and the late *Neglecta* hibernate in chrysalis and give *Violacea* in March and April the next year. But the bulk of the *Violacea* chrysalids must hibernate, though the actual proof by the chrysalids is yet wanting. I have had the same difficulty in carrying them through the winter as with those of *Pseudargiolus*. The singularity of this complicated species is that the form *Pseudargiolus* is stuck in between *Violacea* and *Neglecta*, in the spring, with no direct relation to either. This form perpetuates itself, but gives rise to some *Neglecta* in the late summer, and these last produce *Violacea* the next spring. If this late connection were severed, as is conceivable, *Pseudargiolus* would stand alone, separated entirely from the other forms of the species, and there would be nothing

to show how it originated. No doubt that is one way in which species come to exist.

NEONYMPHA CANTHUS, Bois.–Lec.

CHRYSALIS.—Length .62 inch; breadth across mesonotum, .16, across abdomen, .17 inch; cylindrical, slender; the edges of wing cases prominent on the dorsal side; head case more produced than in Debis *Portlandia* (which species this chrysalis otherwise much resembles), bevelled transversely to a sharp edge, excavated roundly and shallowly at the sides, the top a little incurved, the corners sharp; mesonotum prominent, carinated, the sides flat and sloping, the apex almost angular, being rounded but slightly; color green; the top of head case and dorsal edges of wing cases buff; a buff mid-dorsal stripe, and one on either side of this (sub-dorsal); also a faint lateral stripe of same color.

In CAN. ENT., xv., p. 64, 1883, I described all the preparatory stages of *Canthus*, except the chrysalis, which I had been unable to obtain, larvæ which I had had at one time or other dying before pupation. I received the chrysalis described Aug. 22, 1884, from Mr. James Fletcher, at Ottawa. Mr. Fletcher writes: "The larvæ were quite common this spring in beating the high lake and swamp grasses." It is probably because the natural food of *Canthus* is swamp grass that I have always had so much difficulty in rearing the larvæ on meadow or lawn grass. The larva is in shape, and in most respects, closely like that of *Gemma*. Both are very slender and both carry on head a pair of conical horns, and the chrysalis of *Gemma* shows two long conical processes at end of head case. But in the chrysalis *Canthus* is like *Portlandia*, and of the Satyrus type (as in *S. Alope*), stout bodied, with truncated head case. With this chrysalis we now know every stage of the several species of Neonympha which live east of the Mississippi River.

Experiments with larvæ as to food plants.

The larvæ of *P. Rutulus* feed on willow, and this seems to be the food they prefer, just as *Turnus* prefers the Tulip tree where there is a choice. *Rutulus* was observed by Mr. Behrens, in 1884, on species of Populus. I received larvæ just hatched from Mr. Wright, and lost one brood by giving them Tulip leaves. After two or three days the last one had died, with symptoms of poisoning. Having heard that apple and cherry were food plants of the species, I offered these and willow to the next lot of

larvæ, and found all gathered to the willow. Henceforth I had no difficulty, and found these larvæ as easy to rear as larvæ of *Turnus*.

This suggested an experiment on *Turnus*. There are several lists of food plants of this species, two of them by Mr. Scudder, and nowhere is willow mentioned. I was feeding a brood of these larvæ last year, and on 20th August, immediately after 4th moult, separated part of them and gave willow only. They nibbled a little now and then, but in effect eat nothing, did not grow, were flabby to the touch and empty, and all died of starvation by 2nd Sept. The remaining larvæ, on Tulip, reached pupæ 30th Aug. and 1st Sept.

On relaxing dried butterflies.

I notice, ENT. xvi., 220, something on modes of relaxing insects. For butterflies, I formerly used an earthen jar, with cover, in which were a few inches damp sand, the insects being laid on the sand. But if the sand was at all too wet, the insects were liable to be saturated and much damaged, and if left too long, to mould. For many years I have used a towel, first dipped in water and wrung out, folded twice, and laid on a board. In the folds the papers are laid, or if the butterflies are removed from the papers, they are placed between layers of newspapers. Small species, as Lycaenæ, relax perfectly in 5 or 6 hours; most Hesperians over night; Colias and Argynnis within 24 hours; and Papilios in from 24 to 48 hours, according to size of body. It may be necessary, and certainly will be in warm weather, to wet the towel again, and perhaps with Papilios more than once. On removal, when about to spread, if moisture shows on the under surfaces, remove it by blotting paper. The advantage of this mode is its convenience, and the fact that the insects will not become too wet, nor can they mould, as the towel becomes dry too soon for that.

Butterflies on pins I float on cork in covered tin pails—two quart is a good size. In this case no moisture collects, and the relaxation is about as rapid as in the towel. Small species I often float in a tin-capped glass. If one has not the pail at hand, the floating may be done in anything, a bowl or a pitcher, but a wet cloth should then be laid over the top.

On carrying hibernating larvæ through the winter.

I have sometimes so carried larvæ in ice boxes, or in ice houses, or in snow banks, by aid of friends in the Northern States mostly, but last fall I heard of a large room called a "cooler" at the Sanitarium at Clifton

Springs, New York, in which meat and vegetables are kept, the temperature averaging 40° all the year, and my application for a little space was kindly received. In October, I sent on two boxes by express, in which were a large number of larvæ, some of them very rare. Of these were Argynnis Halcyone, just from egg: Satyrus *Charon*, also just out of egg. These small larvæ were in paper pill boxes, inside tin. There were also a few larvæ of Chionobas *Chryxus*, Hip. *Ridingsii*. Colias *Alexandra*, Phyciodes *Picta*, in stages from second to fourth; and several Melitaea *Rubicunda*, past third moult, from Vancouver's Island, and *Phaeton* at same stage. Early in March I received the larvæ per express. On opening the boxes nearly every one of the young larvæ first named were alive, and in a few moments were moving. The larger part of *Rubicunda* and *Phaeton* were in good condition. One *Alexandra* out of two was healthy, and one *Picta* out of three. The *Chryxus*, past third moult (one), and the *Ridingsii*, past first (one) were dead. On the whole, there was scarcely any loss from the four months seclusion. The Chionobas, I am disposed to think, died in transit to me, from rolling about in its box, as it was stout and healthy looking when I received it. Probably all the Satyrid larvæ would have done better if they had not been allowed to feed in the fall, but had on hatching been subjected to the cold. I had no plants ready for these larvæ on their arrival except grass, and on this I placed part of the *Charon*, who very soon began to eat along the edges of the leaves. The remainder of all species I put on ice, or under rocks in the woods, to stay till I could force food-plants for them.

ADDITIONS TO NORTH AMERICAN HYMENOPTERA.

BY L. PROVANCHER, CAP ROUGE, QUEBEC.

ICHNEUMONIDÆ.

In a lot of Hymenoptera captured in Vancouver Island, and sent me by Mr. Brodie from Toronto, I found the following new species:—

Ichneumon Vancouveriensis, nov. sp.

♂—Length, .62 inch. Black; face with four dots white, one on each side near the clypeus and one under each antenna. These entirely black

and sub-moniliform. One dot on the alar scales with a line before and another one under, the collar, and scutellum, white. Wings slightly infuscated; the areolet pentagonal, the nervures black. Metathorax with the angles projecting, sub-spinose, the ventral area transverse, its anterior angles rounded. Legs black, the four anterior tibiæ with a white line exteriorly, the posterior with a smaller one near the base. Abdomen elongate, with the peduncle slender and punctured, entirely black. Vancouver.

Allied to *Ich. subcyaneus* Cress., but of a larger size, with crura entirely black, and white markings also different.

PLATYSOMA, nov. gen.

(From *platys*, depressed, and *soma*, body.)

Head large, much produced behind the eyes, these somewhat small. Antennæ half the length of the body, setaceous, thick, with short articles sub-moniliform. Thorax long and depressed, the prothorax produced anteriorly in the form of a neck, narrower than the head; the mesothorax with its median lobe advanced and elevated upon the prothorax; scutellum depressed, with a fossula before; the metathorax elongate, bearing four longitudinal carinæ. Wings short, areolet wanting, the nervule dividing the two cubitals short. Legs with crura swelled, inermous, the tibiæ cylindrical at the base, thence enlarged and slightly compressed, the intermediate ones much compressed in the middle of their enlarged portion. Abdomen elongate, shortly pedunculate, the first segment depressed, bearing a carina on the lateral edges, the extremity slightly compressed and cleft under side for the reception of the terebra, which is as long as the body.

Allied to *Xylonomus* and *Odontomerus*, but differing from both by the shorter and thicker antennæ, by the inermous crura, and by the form of the tibiæ.

Platysoma tibialis, nov. sp.

♀—Length .45 inch, length of the terebra .45 inch. Black, with legs rufous and abdomen brownish rufous. The head and prothorax strongly punctulate, the fossula before the scutellum striate. The metathorax transversely striated at the base between the carinæ. The first abdominal segment finely aciculate between the lateral carinæ. Valves of the terebra brown ferruginous. Vancouver.

Limneria compacta, nov. sp.

♀—Length .23 inch. Black, with the legs and abdomen rufous. Mandibles, palpi, and alar scales, white. Antennæ filiform. Thorax short and thick, the mesothorax gibbous, the metathorax declivous. Wings slightly infuscated, with a triangular sessile areolet. Legs rufous, the posterior coxæ black at the base inside. Abdomen forming a small elongate club with a slender and elongate peduncle, black at the base and extremity. Terebra about one fourth the length of the abdomen, recurved upwards. Vancouver.

Closely allied to *L. ruficoxa* Prov., but differing by the sessile areolet, the legs entirely rufous, etc.

Mesoleptus fasciatus, nov. sp.

♂ – Length .20 inch. Black, the face under the antennæ, an orbital patch above their insertion, the palpi, the alar scales, the lateral inferior edges of the prothorax, with the four anterior coxæ and their trochanters, white. Antennæ shorter than the body, setaceous, black, the scape obscurely whitish underneath. Metathorax large, with distinct elevated lines. Wings hyaline, without areolet, the stigma pale. Legs pale rufous, the posterior with the coxæ, and the extremity of their tibiæ and tarsi, brown, more or less obscure. Abdomen rather stout, linear, black, obscurely white on the sides, the segments with a polished fascia at their posterior edge. Vancouver.

Differs from *M. decens* Cress. by its white markings and the sculpture of its metathorax.

Echthrus Provancheri, Brodie.

(Mr. Brodie having kindly dedicated to me this beautiful new species, and not having seen its description published, I submit it here below.)

♀—Length .48 inch. Black, abdomen partly rufous; head and thorax entirely black, very finely punctured; the face with a small tubercle in the middle under the antennæ; mandibles, palpi and antennæ, all black. The mesothorax trilobed, the metathorax rugulose on the sides and posteriorly. Wings slightly infuscated, the nervures and stigma black, the areolet large, subquadrate. Legs rufous, the anterior coxæ, the crura and tibiæ of the posterior pair at their extremity, black, the posterior tarsi with the first and last article black, the median ones white. Abdomen pedunculate, its peduncle polished and shining, the other segments punctulate;

segments 1, 2 and 3 bright rufous, the rest black with the penultimate white. Terebra black, thick, very nearly as long as the body.

♀—With palpi and four anterior coxæ and trochanters pale, no white patch on the penultimate segment of abdomen. Vancouver.

This species is easily distinguished by its coloration.

BRACONIDÆ.

Phylax pacificus, nov. sp.

♀—Length, .35 inch; terebra about the same length. Brown ferruginous; the head, the pro and mesothorax with the last segments of the abdomen, black. Antennæ black, long, setaceous. Head large, produced behind the eyes; vertex convex. Metathorax ferruginous, punctured. Wings infuscated. Legs ferruginous, all the tibiæ with a small pale ring near the base. Abdomen finely aciculate on the first segment and the basal half of the second, the other ones polished, shining. Terebra black, of the same length as the abdomen. Vancouver.

Phylax niger, nov. sp.

♀—Length .23 inch. Black, with a whitish pubescence. The head much produced behind the eyes. Antennæ long, slender, setaceous. Wings slightly infuscated, the nervures black. Legs rufous, coxæ, tibiæ and the extremity of crura black. Abdomen elongate, black, the first segment with the basal half of the second aciculated. Vancouver.

ENTOMOLOGY BY THE ELECTRIC LAMP.

BY PROF. E. W. CLAYPOLE, AKRON, O.

During the past winter an installation of about 100 arc-lamps was established at Akron, O. They hang as usual over the middle of the street. Early in the summer it was evident that they would afford a fine hunting-ground for the entomologist, and accordingly several members of the Natural History Society of Akron resolved to turn the opportunity to account by making collections of the insects attracted by the light and comparing and noting the results.

I have not yet ascertained what others have done, but the following notes of my own observations may interest some readers of the ENTOMOLOGIST:

At the opening of the season the Cockchafer *(L. fusca)* was almost the only visitant, but in such numbers that specimens might be collected by the quart for a few evenings. Gradually other species appeared. *Belostoma americanum* and *Calosoma calidum* were conspicuous, the former for its size, and the latter for its beauty. The former has obtained the popular name of the "electric light bug." It is supposed to have appeared with the lamps, and is oftenest brought to me for identification. The grave-digger beetles, *Necrophorus*, *Silpha* and *Hister*, were not infrequent. Why they come to the light is not easy to say. Possibly the carrion which they usually seek is slightly phosphorescent, and attracts them by its glow, and they are deceived by the brilliancy of the electric arc. Several small Carabids were abundant about the same time, but have not yet been identified.

As June advanced moths became more abundant than beetles, not because the latter fell off, but because the former largely increased. On warm evenings a perfect swarm played round the lamps, hour after hour. Every now and then one and another dashed into the globe, struck the glowing carbons, dimmed the light and was killed or consumed with a hissing noise. By morning a handful, sometimes a half pint, of dead insects was accumulated at the bottom of the lamp-glass, mostly scorched and burnt. In this way immense numbers are destroyed, but no apparent diminution ensued. One morning in June I obtained about a hundred specimens of the very abundant little grass moth *(Crambus mutabilis* Clem.) from every lamp examined. This means a destruction of above ten thousand individuals nightly of this one species. As the process has been going on for at least a fortnight, the 102 lamps in this city have killed about 1,500,000 individuals. Yet still they come, and in undiminished numbers.

Since then Dart-moths (Cut-worms) of various species have begun to appear. About the middle of June I collected above 50 specimens from three lamps. It was apparently *A. subgothica* Haworth, though Riley (Entomolog. Rep. of Mo., 1868, p. 82) says this species does not appear till September. Positive identification of these moths is often difficult. This implies the destruction of about 1,500 nightly. Other species of Dart-moths not yet identified were equally numerous. One would think such wholesale slaughter must diminish their numbers, and perhaps the

results will be seen in future years. If the eggs were laid previously no such result could be expected. But the frequent occurrence of eggs in the collecting boxes shows that this is not the case.

The Tiger Moths (*Arctia*, etc.) have been equally abundant, especially *A. virgo*. Were all that I have collected identified, as I hope they soon will be, the list would be long.

The white-lined Hawk Moth (*D. lineata*) with others of the same family, is a frequent visitor. The Water Tiger, *D. marginalis*, with two or three smaller Dytiscids, are often taken. These and most of the heavy fliers strike the globe and fall stunned to the ground, but soon recover unless boxed at once.

The Stag Beetle (*L. dama*) and Fire fly (*P. pensylvanica*) appeared later and less frequently with the great Lebia (*L. grandis*) and *Dichelonycha elongatula*, the latter for a few evenings in great abundance. A single specimen of the Codling Moth was captured.

About the end of June a new fauna began to appear. The Cockchafers had nearly disappeared. But the great Ground Beetle (*H. caliginosus*) supplied the place, and in so great numbers that one evening I filled a four-once bottle in fifteen minutes. With it came two, to me, unexpected visitants, the Blister Beetles (*L. vittata* and *atrata*).

This is but a partial list of the species already collected. Several of the large and conspicuous moths have been met with, and I hope later to send a longer catalogue.

But we are not the only insect-hunters about the electric lamp. Every evening the toads congregate until the ground is alive with them, and food is so plentiful that they are sometimes almost unable to return to their holes and often past hopping. Several times also I have suspected the presence of skunks, but have never yet seen a frog. Small boys, too, flock to the lights for the sake of stamping on the cockchafers and other insects that lie disabled on the ground. Between the toads, the skunks and the small boys, the entomologist is sometimes hard put to it, and must work late at nights or betimes in the morning, or both. Could he only in addition to the real insects make a collection of the huge phantasmagoric spectres that fly and creep about the roadway projected by the intense light, he would have an array of "bugges" that might fairly be called "terrors by night."

CORRESPONDENCE.

Dear Sir: The following insects have lately een bdetermined for me by Dr. H. A. Hagen, of Cambridge. As they are not included in the Society's published lists, I send them just as received for publication in the ENTOMOLOGIST.

J. ALSTON MOFFAT.

1. *Dicosmoerus (Stenophylax) argus* ♂ Harris. Desc. and fig. in Harris's Ent. Correspond.; also by Provancher.

2. *Pteronarcys proteus* Newm., ♂. Also in N. Y.

3. *Leptoterus nobilis* Hag. Nearly destroyed, but I think surely, though there exist related species.

4. *Ctenophora frontalis* Sacken, ♀. In pieces.

5. *Mallota posticata* Fabr.

6. *Epeolus*, probably; in six or seven pieces.

7. *Archasia galeata* Fabr.

For determination of the four non-Neuroptera, I have taken the names out of our collection. The *Mantispa*—not *Mantis*—is a Hemerobid, and is *M. brunnea* Say; also described by Provancher as very common at St. Hyacinthe. His specimen, *M. Burquei* Prov., was a variety.

H. A. HAGEN.

ROCKY MOUNTAIN BUTTERFLIES.

Dear Sir: Please add the following species to the list of diurnals collected by me in Rocky Mts., beginning at No. 123:

123. *Papilio indra* Reak. Seen but not taken at Koutanai Pass, afterwards identified from specimens received from the Pass.

124. *Pieris vernalis* Edw. Crow's Nest Pass.

125. *Colias elis*, nov. spec., Strecker, (Discovered 1884.) Kicking Horse Pass summit.

126. *Colias chrysomelas* Hy. Edw. 1 ♂ only taken. Calgary.

GAMBLE GEDDES, Toronto, Ont.

The Canadian Entomologist.

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NOTES AND DESCRIPTIONS OF NORTH AMERICAN XYLOPHAGIDÆ AND STRATIOMYIDÆ.

BY S. W. WILLISTON, M. D., PH. D., NEW HAVEN, CONN.

Xylophagus decorus, n. sp.

♀. Length 13 mm. Black, legs yellow. Front convex, but little shining, thinly brownish dusted. Antennæ black, the tip of first joint and the second more reddish brown; elongate, the first joint rather longer than the distance from the insertion to the ocelli. Proboscis black Dorsum of thorax shining on the sides, in the middle with two broad brownish pollinose stripes, separated by a shining linear space. Pleuræ shining black. Abdomen blackish brown, shining. Legs, including the coxæ, reddish yellow, the tips of all the tarsi black. Wings nearly hyaline, a broad brownish band, near the middle, narrowed and evanescent posteriorly, the outer cross-veins clouded and the outer part of the wing cinereous.

One specimen, Washington Territory (H. K. Morrison). The abdomen probably varies in depth of color.

Xylophagus gracilis, n. sp.

♂, ♀. Length 9-10 mm. Black, legs light yellow. Front grayish dusted. Antennæ black, the third joint toward the base on the inside, yellowish; only a little longer than the head; first joint only about three times as long as the second, considerably shorter than the distance from the insertion to the ocelli. Thorax shining, the dorsum with two broad, narrowly separated, pollinose stripes; humeri and post-alar callosities obscurely yellowish. Halteres yellow. Abdomen shining black, white pubescent, rather slender and cylindrical in the male. Legs, including the coxæ, light yellow; outer end of all the femora, and the tip of hind tibiæ, lightly brownish; tip of the tarsi blackish. Wings hyaline, variegated on the outer half with brownish, the stigma narrowly brown.

Two specimens, Washington Terr. and Mt. Hood, Oregon (H. K. Morrison).

Coenomyia cinereibarbis Bigot. Annales Soc. Ent. Fr. 1879, 194.

This species was described by Bigot from a specimen from Baltimore. As usual with this author, he does not point out differences, merely saying that this species resembles certain varieties of *C. ferruginea* in color. Now it is well known that *C. ferruginea* is very variable in coloration, so much so, in fact, that it has received twelve or thirteen specific names. The coloration hence of Mr. Bigot's specimen, from analogy, is comparatively worthless as a specific character. Nothing else is mentioned except the villosity. From this, however, I believe I recognize the species in a male specimen caught in the woods near New Haven, in June. It is of a deep brownish black, the femora of the same color. The abdomen above has the second segment wholly black (shining), the third segment with a large light yellow spot on the posterior angles, the fourth segment with a similar but smaller one, and with the posterior margin likewise yellow, the remaining segments chiefly yellow. The species will be best distinguished from *C. ferruginea* by the presence of rather long and abundant yellow pile on the dorsum of the thorax, whereas in *ferruginea* the dorsum is nearly bare.

Subula pallipes Loew.

This species has hitherto only been known from the Atlantic States, but specimens from Montana (Prof. Comstock, No. 50) and Southern California cannot be separated. The western specimens show a broader yellow hind margin to the abdominal segments, but otherwise I can distinguish no difference.

Subula parens, n. sp.

♀. Length 13 mm. Front black, light yellowish pubescent, shining about the ocelli. Antennæ black, the inner side from the base, except the upper margin, yellowish red. Face black, proboscis and tip of the palpi reddish yellow. Dorsum of thorax black, the lateral margins, interrupted just behind the suture, and extending inwards a short distance in front, and a slender spot on the suture on each side, yellow. Pleuræ and coxæ black, the former with a median vertical spot, connected above with a slender stripe reaching from the humeri to the root of the wings, and a large spot on the sides of the metanotum, yellow. Abdomen brownish

red, black at the base. Legs yellow, a broad preapical ring on the hind femora black, the ends of the hind tibiæ brown, hind metatarsi a half longer than the remaining joints together. Wings strongly tinged with yellow, the veins a little darker.

One specimen, Washington Ty. (H. K. Morrison).

Beris mexicana Bell.?

♂, ♀. Length 7–8 mm. Eyes pilose, broadly contiguous in the male, the frontal triangle small; front in female rather broad, with parallel sides. Head black, shining, with luteous pile. Antennæ black, the base of the third joint yellowish; third joint thick at the base, the whole antenna not longer than the distance from its base to the ocelli. Thorax and scutellum bright shining green, with a purplish reflection, pile in the male only moderately long, luteous; scutellum with six blackish spines, and on each side sometimes with a rudimentary additional one. Abdomen black, but little shining, along the sides with yellowish pile. Legs yellow; all the tarsi, except the base or larger part of the first joint, black. Hind metatarsi in the male considerably swollen, longer than the remaining joints together. Wings strongly tinged with yellowish, the stigma large, brown.

Six specimens, Colorado (Morrison, Prof. Comstock, No. 47). Some of the specimens have the hind femora above at the tip blackish. This species is most closely allied to *B. mexicana* Bell., but differs in the abdomen being wholly black. A comparison with Mexican specimens is needed.

Sargus decorus Say. (= ? *S. xanthopus* Wied.)

Hab. New Eng., Colo., Wash. Ty.

Sargus viridis Say.

(*Sargus nigribarbis* Bigot, Annales Soc. Ent. France, 1879, 224.)

Hab. Eastern, Middle and Pacific States.

This species is a true *Sargus;* the eyes of the male are not contiguous, and are bare.

Macrosargus clavis, n. sp.

♂, ♀. Length 9-10 mm. Vertical triangle and the under part of the face in the male, and the upper two-thirds of the front and the face likewise in the female, bright shining green, frontal triangle and the lower part of the front (♀) moderately projecting, yellowish white, front in the

female of moderate width, parallel. Antennæ and proboscis yellow. Thorax bright shining green ; humeri and a slender line reaching to the root of the wings, and the sides of the metanotum broadly, light yellow ; pile of dorsum and mesopleuræ yellow. Abdomen in the male pedicillate, the second segment cylindrical, in the female moderately contracted toward the base ; black, with a bronze lustre ; second segment in the female, except the lateral margins, yellow ; the posterior angles of the third and fourth segments narrowly yellow ; in the male the second segment is obscure yellow ; pile golden. Legs, including the coxæ, yellow. Wings nearly hyaline.

Two specimens, Virginia (Theo. Pergande) and North Carolina (Prof. Comstock).

Ptecticus Sackenii, n. sp.

[*Ptecticus testaceus* Osten Sacken (non Fabr.), Cat. Dipt. 45 ; Lynch Arribalzaga, Catalogo, etc., 125 (17).]

♀. Length 11 mm. Front narrow, shining black, the lower part and the face yellowish white. Thorax yellow, the dorsum with three broad, more brownish, stripes. Abdomen reddish yellow, the second, third and fourth segments with a black fascia, acute at each end and not reaching the lateral margin. Legs yellow, the hind tibiæ brownish, becoming black at distal end, hind metatarsi black, the following joints nearly white, last three joints of front tarsi blackish, of middle tarsi brownish, the third joint of all these tarsi less dark. Wings hyaline, with a light yellowish tinge.

A specimen from Florida (Pergande) agrees with the ones mentioned by Baron Osten Sacken in the note on page 45 in having the four last joints of the hind tarsi yellow, the terminal ones not being black, as described. Lynch says in regard to these species (l. c.) : " Los ejemplares de Nueva York de que habla Osten Sacken deben pertenecer a otra ; todos los mios tienen los tarsos posteriores como los describe Rondani."

Ptecticus similis, n. sp.

♂, ♀. Length 11-12 mm. Head and antennæ wholly yellow, the frontal tubercle below prominent, the small ocelliferous tubercle black. The front in the female narrow ; in the male the eyes nearly contiguous above the tubercle. Thorax yellowish amber color, the humeri, postalar callosities, the sutures narrowly, and a large spot on the sides of the metanotum, light greenish, two linear stripes on the back part of the dorsum,

less distinctly so. Knob of the halteres green. Abdomen brownish yellow, the incisures and posterior angles of the segments yellow, the sides of the base greenish, across the anterior part of the segments the color broadly brown. Legs reddish yellow, the hind tibiæ and tarsi brown, two last joints of all the tarsi blackish. Wings with a faint yellowish tinge.

Three specimens, Virginia (Pergande), and Georgia. I would at first have identified this species with *Sargus trivitatus* of Say, but grass green can in no wise be applied to my specimens, the color being so faint green that it is scarcely observable to the naked eye. The third joint of the antennæ is by no means rounded, but trapezoidal in shape.

Hermetia aurata Bellardi, Saggio, etc. i., 27, tab. i., fig. 8; Loew, Centur. x., 11 *(H. chrysopila)*.

A single specimen from New Mexico agrees very well with the descriptions. The first joint of the antennæ is chiefly black.

Hermetia lativentris Bellardi, op. cit., 27, tab. i. fig. 9.

A female from New Mexico. I refer to this with some doubt. The head is wholly yellow, except the ocelli; the first segment of the abdomen is not black, the second has a narrow median black stripe. Bellardi's figure shows but three posterior veins, probably an inaccuracy.

Hermetia Comstocki, n. sp.

♂, ♀. Length 15-18 mm. Head reddish yellow, with yellow pile. Antennæ only a little darker yellow, the tip of the second joint and the lamella deep black; lamella rather broad. Dorsum of thorax blackish brown or black, the sides and the middle behind brownish red; the black forms two rather broad median stripes, abbreviated behind, separated by a golden tomentose stripe; on each side there are two large indefinite black spots; on each humerus, running inwards and backwards for a short distance, a spot of golden tomentum. Pleurae, except above and the sides of the metanotum, black, a spot above, contiguous with that on the side of the dorsum, clothed with yellow pile. Scutellum yellowish red, the base narrowly black. Abdomen brownish red, but variable, sometimes brown or blackish, the second segment on its posterior border and the remainder of the abdomen, with short thick golden pile, changeable in different reflections. Abdomen elongate, broadest on the second segment. Legs wholly reddish yellow, front coxæ in front of the same color, the tarsi a little lighter, tibiæ somewhat dilated, the hind pair very distinctly

bent beyond the middle in the male. Wings deep brown along the anterior half, broadly infuscated along the posterior border, leaving a space hyaline in the anal cell and the base of the fifth posterior cell.

This is a handsome large species, rather larger than *illucens*, which it resembles in shape, the abdomen being more convex. Two specimens, Arizona, from Professor Comstock (No. 46).

Euparhyphus, n. sp.?

♀. Length 6 mm. The head and thorax of this species agree throughout with Loew's description of *E. stigmaticalis*, except that the scutellum is yellow, with the base narrowly black. The abdomen shows a distinct difference in that the first segment has a small lateral spot, and the second, third and fourth segments with a large green triangle on the posterior angles, extending to the front margin of the segment and touching each other behind on the fourth segment; the inner margins of these green spots are yellowish. The fifth segment is wholly greenish and yellowish to the naked eye. The abdomen shows a broad greenish yellow margin. The legs are wholly yellow, except the last three joints of the tarsi, which are black. The wings agree also, except that the veins and stigma are less dark.

One specimen, Washington Territory.

Euparhyphus ornatus, n. sp.

♀. Length 6 mm. Front and face yellow, with black markings, as follows: A spot on each side in front of the ocelli; a slender stripe from near the ocelli to the oral margin, interrupted at the antennæ; a broader stripe (broader above) beginning a little lower on each side and reaching to the oral margin. First two joints of the antennæ yellow, the third wanting. Occiput black. The lateral orbits yellow. The lateral margins of the face, and the posterior orbits below, white pollinose. Thorax black. Two very slender dorsal vittulæ, broadly separated, the humeri and a slender line reaching to the base of the wings, the postalar callosities, the margin of the scutellum and spines, a spot in front of the wings on the pleuræ, contiguous with the line above it, and a smaller spot below, yellow. Abdomen black; the third segment on each side, with a rather large semi-elliptical spot, the slender lateral margin of the remaining segments, and the broader hind margin of the last segment, yellow. Legs yellow; the hind femora and tibiæ in their middle infuscated; the last

three joints of all the tarsi blackish. Wings with the veins of the disk fuscous; third vein furcate.

One specimen, Washington Territory.

Euparhyphus bellus Loew.

Three specimens from Pennsylvania, all evidently of the same species. I identify as this, but the species is variable. The head in both females agrees with the description; the head of the male likewise agrees with the specimen spoken of in the note. In one female there are two slender yellow vittuke in the front of the dorsum, in the other two it is wanting. The scutellum is wholly black in all, except the spines. The abdomen in all agree in having two small circular yellow spots on the disc of the third segment, a minute yellow spot on the posterior angles of the third and fourth segments, and a large semi-oval yellow spot on the fifth segment, otherwise the abdomen is wholly black. In one of the females the first discal posterior vein is but the merest rudiment. I do not doubt but that Loew's male and female specimens belonged together.

A single male specimen from Connecticut is related, but it may be different. It is somewhat larger, and differs from my male of *E. bellus* in having two larger yellow spots on the disk of the third segment, and two additional similar ones on the fourth segment.

Clitellaria lata Loew.

A male specimen from Washington is apparently this.

A female from California has the pubescence of the head and abdomen more golden colored than white, and the third antennal joint is much more thickened.

Clitellaria argentata, n. sp.

Length 8 mm. ♂. Black, with light colored pile and silvery pubescence. Eyes broadly contiguous, thickly fuscous pilose. Pile of the front and face light gray. Antennæ rather slender; first two joints, tip of the third, and style black, remainder yellowish red. Thorax, with light gray pile and nearly uniform recumbent silvery pubescence; a slender median stripe, a little broader, interrupted one, on each side, two small spots on the pleuræ, and the metanotum, glabrous; spines of the scutellum yellow. Abdomen, with short recumbent white pile, nearly uniform, with small, oval, nearly glabrous spots on the front margins of the anterior

segments. Legs with white pile, the color of the tarsi less dark. Wings nearly hyaline, the stigma luteous.

One specimen, Arizona, (Prof. Comstock).

Cyphomyia, n. sp.

Five male specimens from Jamaica differ from the described species, except perhaps *varipes* Gerst., the description of which I do not have access to. The base of the third joint of the antennæ, and the scutellum, are red, and all the metatarsi, except the tip, light yellow. Otherwise steel-blue black. The eyes pilose.

Nemotelus unicolor, Loew.

Two specimens from Pennsylvania. In one of them the two basal joints of the antennæ are yellowish. Another from Arizona (Prof. Comstock, No. 52) I cannot distinguish.

Nemotelus crassus Loew.

Three specimens from Western Kansas agree with the description of this species, but are somewhat smaller.

Pachygaster pulchris Loew.

Two females from Montana differ but little from eastern specimens. The femora have only a blackish ring in their middle.

Odontomyia cincta Olivier. Encycl. Meth. viii., 432, 3; Macquart, Dipt. Exot. i. 2, 189; Day, Proc. Acad. Nat. Sc. 1882, p. 80 (*O. extremis*, type compared.) Atlantic and Pacific States.

Odontomyia flava Day. Proc. Acad. Nat. Sc., 1882, 76.

The type specimen in my collection is partly destroyed by Anthreni, I give as complete a description as it will permit.

♂. Length 11 mm. Head black, face of usual size, with two obscure yellowish spots below, clothed with light colored pile. Dorsum of thorax black, with rather long light pile. Scutellum black, the spines of the same color, rather small and approximate. Abdomen black, with a rather narrow yellow margin and with two slender, broadly interrupted, yellow. posterior cross-bands (on the second and third segments), venter yellow. Legs yellow; femora at their base, and the distal part of the tarsi brown, the tibiæ in their middle with a brownish ring. Wing hyaline. Veins yellow, third longitudinal vein furcate, third posterior vein rudimentary.

Como, Wyo. Resembles *O. inequalis* Loew, but differs in the scutellum and abdomen.

ON THE HESSIAN FLY IN ITALY.

BY H. A. HAGEN, CAMBRIDGE, MASS.

As I have stated (p. 90, May, 1885), I had made inquiry of Dr. Anton Dohrn about the existence of the Hessian Fly around Naples, Italy. His kind answer, together with interesting notes by Dr. Paul Mayer, gives the following information.

From the two old books quoted by Sir J. Banks (p. 88), Corti is not represented in the library at Naples. Ginnani (Dr. Giuseppe Fatta writes Giannini), Part ii., cap. lx., p. 127-209, gives: "Osservazioni ed esperienze particolari intorno all'infestamente degli insetti." He speaks in this chapter on several flies which attack the grain, among them one which attacks the roots, but his statements do not allow us to decide with certainty whether some of the flies belong to Cecidomyia. Dr. P. Mayer draws my attention to another work which was entirely unknown to me; the copies published are all lithographed: "*A. Costa.*—Lezioni di Entomologia agraria precedute da un quadro generale della classi del regno animale raccolte ed autografate degli alumni M. Pilato e M. Montanari. Portici R. Scuola Superiore d' Agricoltura 1880, 4to., pg. 528, pl. 9."

"*Cecidomyia tritici*, p. 514, sp.

"Body black, sooty; wings blackish, a little paler towards the base; legs brownish. The females deposit the eggs near the joints of the plant and between the stem and the respective leaf. The larvæ, which are hatched, live gregarious near the lower joints of the plant between the leaves and the stem, in which they sometimes excavate niches by shaving the wall of the stem. The plants for this cause sooner or later grow sickly and never straighten themselves. When the larvæ have completed their development, while some give place to an agamous reproduction, others in the very place in which they find themselves are transformed into pupæ, from which after a few days are hatched perfect insects, which lay new eggs."

It follows a short description of the larva. Tearing out the plants and burning them is quoted as a remedy.

"In our province (Naples) the Cecidomyia is not frequent. According to facts which are reported to us, they are abundant in the neighborhood of Brindisi, as Signor Montagna has also assured us, who has sent us specimens."

Dr. A. Dohrn has made inquiries in Rome about the Hessian fly, but without success.

The passage quoted out of A. Costa's lectures is of prominent interest. It proves without any doubt that the insect is *not C. tritici*, which never lays the eggs between the stem and the leaf, and which has never the coloration of the imago as given in the description. Both facts agree perfectly well with *C. destructor*. The determination of a species of Cecidomyia of course can not be considered to be doubtless before specimens have been compared, the more as the short description contains some statements which if based on personal observation, are entirely new.

One of them is decidedly startling. I point to the fact that some larvæ after having completed their development, give place to an *agamous reproduction*. [Compito che hanno, queste larve, il loro sviluppo, mentre talune danno luogo alle riproduzioni agamiche altre, nel posto stesso in cui trovansi si transformano in pupe delle quali dopo pochi giorni schindono gl'insetti perfetti che depongono novelle uova.]

I have purposely put the Italian text in brackets after the translation, as the end of the passage seems to state that the larvæ which have an agamous reproduction do not when full grown transform themselves into pupæ. A similar reproduction, as is well known, has been observed in several species of Cecidomyia by Nic. Wagner, Meinert, Leuckart and others—the so-called paedogenesis. It has never been observed till now for the Hessian fly, and the principal reason for doubt that Mr. A. Costa has really meant paedogenesis, is the fact that he has not expressed himself in a more explicit manner, though he must have been aware of the importance of his statement. I should remark that Mr. Balt. Wagner speaks indeed of two different kinds of larvæ of the Hessian fly. The fact that females of the Hessian fly lay eggs without copulation was long ago published by myself. These eggs developed so far that the segmentation of the embryo was visible. The glass tube containing the eggs having unfortunately been left in the sunlight, no further development could be observed.

Mr. A. Costa states that the larvæ sometimes make niches by *shaving* the wall of the stem. This is contrary to all other observations, which state that these niches are made simply by pressure. Asa Fitch is very explicit about these facts, but when he states that the larvæ do not enter the central cavity of the stem, he is largely at variance with the direct observations of Mr. B. Wagner and myself. I have indeed still before me

stems with the flax-seed (pupa) in the centre of the stem. The larvæ live gregariously, according to Mr. A. Costa, but I have never found more than four pupæ at one joint.

After all, it would be of prominent importance to compare the species from Naples with specimens of the true Hessian fly, which was collected there long ago by Prof. Dana.

DETERMINATION OF THE 36 COLEOPTERA DESCRIBED BY D. ZIEGLER.

BY SAMUEL HENSHAW, BOSTON, MASS.

"Descriptions of New North American Coleoptera," Proc. Acad., 1844, v. 2, p. 43–47; 1845, v. 2, p. 266–272.

	Oxyporus pulcher.	43	W. Pa.	= O. femoralis, Grav.
	Diacanthus splendens.	44	"	Belongs to Corymbites.
	Scyrtes suturalis.		Pa.	= S. orbiculatus, Fabr.
	Hydnocera? longicollis.		"	
5	Spercheus tessellatus.		"	= Belongs to Hydrobius.
	Hydrophilus ovalis.	45	"	Name ‖ = H. ovatus, G. & R.
	Coprobius obtusidens.		"	= Canthon laevis, Drury.
	Pandarus? brunneus.		"	Belongs to Anaedus.
	Cistela marginata.	46	"	
10	erythroptera.		"	= C. brevis, Say.
	Pedilus nigricans.		"	= Corphyra lugubris, Say.
	haemorrhoidalis.		"	= " elegans, Hentz.
	ruficollis.	47	"	= " elegans, Hentz.
	marginicollis.		"	= " labiata, Say.
15	Monohammus tomentosus.		"	= Goes tigrinus, DeGeer.
	Oedionychis? hispida.		"	= Hypolampis pilosa, Illig.

	Philonthus ater.	266	Pa.	= Quedius capucinus, Grav.
	Tachinus puncticollis.	267	"	= T. fimbriatus, Grav.?
	Phoenops luteosignata.		Geo.	= Melanophila notata, L. & G.
20	Agrilus quadriimpressus.		"	= A. acutipennis, Mannerh.
	Limonius definitus.	268	Car.	

	Priocera albomaculata.	U. S.	= Cregya vetusta, Spin.
	? maculata.	Car.	= P. castanea, Newm.
	Trogoderma pallipes. 269	Pa.	
25	Elodes debilis.	Car.	= Anchytarsus bicolor, Melsh
	fragilis.	"	= Cyphon ruficollis, Say.
	Eubria thoracica.	Pa.	= E. nervosa, Melsh.
	Cis thoracicornis. 270	Car.	Belongs to Ennearthron.
	Lathridius musaeorum.	"	= Silvanus advena, Walt.
30	unicolor.	"	= Cercyon castaneum, Say.
	Mycetophagus pini.	"	
	Monotoma opaca. 271	Pa.	= M. fulvipes, Melsh.
	Psylliodes alternata.	"	Belongs to Longitarsus.
	Lycoperdina puncticollis.	"	= Phymaphora pulchella, Newm.
35	unicolor. 272	"	Belongs to Rhanis.
	testacea.	"	" Mycetina.

BIOGRAPHICAL NOTICE OF REV. D. ZIEGLER.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

As I have stated in my notice on Melsheimer, nothing is known of his friend, Rev. D. Ziegler, except the publication of a paper on Coleoptera. Again I am indebted for a large part of the notice now given to the untiring kindness of Rev. J. G. Morris, of Baltimore, for many years a friend and correspondent of Rev. D. Ziegler. Nevertheless, desiring to find out something more of this father of American Entomology, I decided to go to York, Pa., and had the pleasure of seeing his wife, Mrs. Ziegler, his son, Dr. H. A. Ziegler, and the brother of Rev. D. Ziegler.

Daniel Ziegler was born June 11th, 1804, in Reading, Berks Co., Pa. His father, and probably his grandfather, were born in America. There is nothing known by the family as to when their ancestors came to America. After he became of age he studied at the University of Pennsylvania for some time. Later he studied Theology at York, Pa., at the German Reformed Seminary, under the presidency of Dr. Mayer. He was married to Miss Eve Eyster, and had ten children, of whom two sons are living. Kraeutz-Creek Church, six miles from York, was his first

pastoral charge, which he served 37 years. During 18 years he took care of 8 churches; during 27 years of 6 churches. Later he retained only four. Afterwards he was elected to the German congregation in York, which he served about 13 years.

During his ministry in Kraeutx-Creek he began to collect insects and to study Entomology. His son told me that he often accompanied his father, and that he collected insects principally by beating in the umbrella, an excellent method, but very little used, as far as I know, in America. One of his churches was very near to Dr. Melsheimer's home. We owe to this circumstance probably the friendship and the zeal for entomological studies of both. To help Dr. Melsheimer in describing the new species of Coleoptera for the forthcoming Catalogue, Rev. D. Ziegler published in Proc. Acad. Sc. Philad., 1844, vol. ii., p. 43–47, his only entomological paper, containing 36 new species. His scientific correspondence, which was considerable, both American and foreign, cannot be found. His library contained some excellent works, all very much used. When 60 years old he sold, together with Dr. Melsheimer, his collection to Prof. L. Agassiz. The collection was packed up and forwarded to Cambridge by Mr. Ph. R. Uhler, from Baltimore. The contents of the collection are given in my Melsheimer paper, p. 196. Rev. J. G. Morris writes: "I remember hearing Ziegler say that he sold his specimens of Hymenoptera to a Swiss naturalist who has written upon that order, perhaps to De Saussure." This may explain the fact that the collection contained only 60 species of N. Amer. Hymenoptera and 14 from Europe. Rev. D. Ziegler died May 23, 1876, in York, Pa., 71 years, 10 months, 12 days old.

"There was nothing whatever eventful in his life, and besides his few entomological contributions, he was nothing more than a plain, plodding, honest country parson."—(J. G. Morris).

DESCRIPTION OF TWO NEW VARIETIES OF CATOCALA CEROGAMA, Guen., WITH NOTE ON A THIRD.

BY PH. FISCHER, BUFFALO, N. Y.

C. aurella, ♀, new var.

Primaries and thorax light gray, strongly shaded with yellow; h. p. and t. p. line with t. a. line very distinct; teeth below U somewhat

rounded ; reniform indistinct ; subreniform distinct ; a broad, pale, tan-colored line (outside of white shading of t. p. line) running parallel with t. p. line.

Secondaries bright yellow ; median band black, narrow, even, not reaching inner margin, marginal band broad, black with a slight yellow tinge ; fringes dirty white ; abdomen ochre-yellow.

C. eliza, ♀, new var.

Primaries very dark, powdered with black, a large egg-shaped whitish dash near apex reaching costa ; another larger one, shaded somewhat with dark gray, extends from the elongated U to lower margin. Whitish, slightly powdered with gray at base. T. a. line edged with an unusually broad white dash reaching from costa to base of subreniform (on its inner side), from which it is divided by a narrow dark line. All these white dashes are very prominent and showy. Reniform not very distinct.

Secondaries more like the typical form, with the exception of being lighter and more yellowish at base ; fringes white, except at ends of veins .

The third specimen comes nearer the typical *cerogama*, and is a male. The primaries are strongly marked, slightly darker ; reniform distinct ; subreniform met by a heavy black dash on the side towards base, running along t. a. line to costa. There is the "slightly brown" of the var. *Bunkerii*.

Secondaries with a narrow yellow band, the black quite prominent and with a faint purple hue. Fringes white tipped with black.

The aboue specimens are in my collection.

WHITE ANTS DESTROYING LIVING TREES AND CHANGING THF FOLIAGE, IN CAMBRIDGE, MASS.

BY H. A. HAGEN, CAMBRIDGE, MASS.

The common white ant, *Termes flavipes*, destroys dead wood, stumps of trees and timber, just as does its nearest relative, *T. lucifugus*, in Europe. Of the latter species some cases are reported where living pines and oaks have been destroyed in the South of France. For *T. flavipes*, only one case is known, in which living grape vines in a hot house in Salem were injured. (S. H. Scudder, Proc. Boston, N. H. S., vol. 7, p. 287). Now the earth in the hot houses here in Cambridge is largely

infested by white ants, but as far as I know, no destruction of plants has been observed. I was very much interested by the information from Mr. F. W. Putnam that in a garden in Irwing street living maples were largely infested by white ants. The evidence of the truth of this information was apparent by the first glance at the trees. They were three in number, some few yards separated, more than 60 feet high, two feet diameter at base, and apparently in good condition, except that the bark was in certain places affected or split. Those places had somewhat the appearance of the well-known winter splits of the bark of trees. In removing parts of the bark, directly living white ants, workers and a few soldiers, were found, collected, and proved to belong to *T. flavipes*. Closer observation showed that small open gangs, covered outside by the loose bark, ran along the tree to a height of 30 feet or more. There were on this estate no old rotten stumps, but some of the adjacent uninhabited estates contained them, where probably the nest may be found; nevertheless the whole estate was so overrun by white ants that they had made along the fence a long track covered with the hard clay-like mud with which they usually fill the eaten parts. As the boards of the fence were thin, it was perhaps judged safer to build the canal outside instead of on the interior of the boards. The house, a framehouse, about 10 years old, the stables and the wooden sheds were entirely intact. The estate near to it seemed to be entirely free of the pest. The foliage of the infested trees looked very remarkable. Mr. Sereno Watson, the curator of the Cambridge Herbarium, was at first at loss to determine the leaves; the size, the shape and the venation would not agree with any known species. But when he saw the tree, he was directly sure that it was only the common *Acer rubrum*. Some fresh shoots near the base of the tree had unmistakably the leaves of the common red maple. All the other leaves were very small, mostly not more than two inches broad, the midian lobe often short, sometimes blunt and not longer than the side lobes; the rips below were about yellowish and decidedly less dark than on the red maple. The owner of the estate had for ten years not observed any change in the foliage of the trees. During the last winter the upper part of one tree, some 20 feet, broke down in a gale, and proved to be not infested by white ants. Now it was considered safe to fell the whole tree. The bark was, in the place where the gangs went up along the tree, extensively bored and hollowed by the white ants. The wood itself was only two feet above the ground, filled with the common white ant holes and gangs, but no

more than one inch deep around the stump. The inner part of the tree showed the wood perfectly sound for 30 feet, except a perpendicular hole of two inches diameter in the middle of the tree, going down to the root. This hole, perhaps made by squirrels, had black ants as inhabitants. The two other trees are still standing. In consequence of those facts, I looked around in Cambridge, and have now the suspicion that perhaps the injury done to living trees may be less rare than I had supposed If similar observations are made by entomologists, I would be thankful to have them communicated to me.

ON THE RELATIONS OF FUNGI TO GALLS AND TO LARVÆ OF CECIDOMYIA LIVING IN GALLS.

BY DR. FRIEDRICH THOMAS, OHRDRUF, NEAR GOTHA, GERMANY.

[This paper, an excellent addition to an excellent American paper by Mr. W. Trelease (Psyche, vol. iv., p. 195), is published in the Jrmischia, Vol. v., No. 1, p. 4, 1885. As it will be difficult for American students to have access to this periodical, I have translated the substance. Dr. Thomas has seen only the record of Mr. Trelease's paper in Botan. Centralblatt, xx., p. 356, by Dr. Ludwig.—H. A. HAGEN.]

Larvæ of Cecidomyia living in the spore-layers of Uredineæ are also found in Thuringia, Germany. In fact the discovery of the community in the same layer of two otherwise very different parasites is at first somewhat wonderful and startling. The right explanation will be a double symbiosis of a phanerogamous plant and of a fungus, and of a fungus and an entomozoon. Years ago I received from Gotha such larvæ out of the rust-fungus of Rosa. A similar manner of living is known in Germany for *Diplosis coniophaga*, Winnertz, and for *D. cæomatis*, Winn. Their larvæ were found by F. Loew in the rust-fungus of several plants (of Verh. Zool. Bot. Ges. Wien., 1874, p. 155). I am able to add two new facts. I found larvæ of Cecidomyia on *Vaccinium uliginosum* in the spore layers of *Thecospora Myrtillina*, Karsten (*Melampsora vaccinii*, Alb. et, Schn) on the Beerberg in the Thueringerwald. The other one was sent to me by Dr. E. Levier from Florence, Italy. The leaves of *Tanacetum balsamita*, L. (Erba'di Santa Maria) had in the *Puccinia Tanaceti balsamitæ*, D. C., many small, red larvæ of Cecidomyia. I am not of the opinion

that this guard is of prominent advantage for the plant. The enormous numbers of the spores of the rust-fungus will scarcely be diminished by these larvæ to any extent, that the guard may be considered to be a practical advantage for the plant.

The second point of interest in Mr. Trelease's paper is that the larvæ open the way for the fungus in the plants. I may state as an analogous fact, that here the pustulae and pocks on the leaves of Pomaceæ, made by Phytoptus, are not rarely filled by fungi, especially by the carbonized ones. The last plant I received by the late Alex. Braun, in 1877, from Blankenburg, Hartz., was a leaf of *Sorbus aucuparia*, with fungus immigrated in the galls of the mites.

A NOTE ON SOME HYDROPHILIDÆ.

BY GEORGE H. HORN, M. D.

Hydrophilus, as heretofore recognized in our fauna, contains two sets of species, the one series large, the other relatively small. They also differ in the form of the maxillary palpi and should properly be considered distinct genera defined as follows:—

HYDROPHILUS.—Terminal joint of maxillary palpi much shorter than the penultimate, the second joint long, arcuate. Claws toothed.

TROPISTERNUS.—Terminal joint as long or even longer than the penultimate, the second joint moderately long and straight. Claws not toothed.

The large species belong to the first series, and but two have appeared in our lists.

In the Biologia Cent. Am., vol. 1, pt. 2, p. 54, Dr. Sharp mentions two others as occurring in our faunal limits, *H. insularis* Cast. and *H. ater* Fab. The former has long been known to us, but has remained without name in our cabinets. The latter, which I have never seen, is quoted rather indefinitely by Dr. Sharp, "Philadelphia, Texas."

The species known in American collections are as follows:—

H. ovatus G. & H. *(ovalis* || Zieg.) Form more broadly oval, thorax more deflexed in front. Prosternal groove open in front. Abdomen opaque, densely finely pubescent, except a narrow space at the middle of the last three ventral segments.

The claws of the anterior tarsi ♂ are very nearly equal, the last joint about one and a half times the length of the four preceding joints and not broader than these, as is the case in the next two species. The tooth of the tarsal claws is much longer than in either of the foregoing species. This species is readily recognized It is less widely distributed than the others, but specimens are known to me from Pennsylvania, Missouri and Georgia.

H. triangularis Say. More elongate and narrower than either the preceding or next species. Prosternal groove closed in front. Ventral segments smooth and shining, except for a narrow space on each side, each segment with a conspicuous pale spot.

The male has the claws of the anterior tarsi very unequal, the anterior or outer being much larger and stronger, the last tarsal joint oblong, wider and a little longer than the preceding joints together, and much longer than wide.

This species occurs from the Middle States to Oregon, southward into Mexico.

H. insularis Cast. Larger than the preceding species and less slender. Prosternal groove closed. Abdomen smooth, the sides narrowly opaque, the yellow spots very indistinct or absent.

The male has the anterior claws very unequal, the last joint of the front tarsi as long as the preceding four, broadly triangularly dilated, slightly broader than long.

When once the form of these two species is fixed in the eye, there is no difficulty in distinguishing them independently of the male characters, which are very obvious.

This species is known to me from Texas and Arizona. It extends to Guatemala, and occurs also in the Antilles.

Tropisternus apicipalpis Chevr. This species should be added to our lists. It is much larger than our other species and more narrowed posteriorly. The terminal joint of the maxillary palpi is a little shorter than the preceding, thereby approaching Hydrophilus. The last ventral segment has a strong spiniform crest. It is more nearly related in our fauna to *glaber* and *mixtus*, and differs from both not only in its larger size and by being more narrowed posteriorly, but also by the middle and hind femora being very dissimilarly punctate.

Occurs in Arizona, the peninsula of California, and in Mexico.

Berosus Salvini Sharp, Biol. loc. cit. p. 79. This species also occurs in our fauna. It belongs to the same series as *punctatissimus* and resembles it, but is rather more elongate, the sculpture smoother and the apical spines of the elytra more prolonged.

Occurs in Texas and Mexico.

BOOK NOTICES.

Report of the Dominion Entomologist for 1884.—Department of Agriculture. Ottawa.

A long felt want has at last been supplied in the appointment of a Dominion Entomologist, and a well qualified expert selected for the work, Mr. James Fletcher, whose preliminary report is before us. His appointment was made so late in the season that he has been unable to do more than furnish a brief report, in which reference is made to the organization of the department under his charge and the measures taken to interest all those engaged in agriculture and horticulture in the work. Following this is a report on the quality of the Paris green found in the market, with results of the analysis of six samples; also reports on insects injuring grain crops, hay and clover, peas, root crops, fruits and forest trees; altogether a useful review of the chief injuries caused by insects to these several crops during 1884. We sincerely congratulate Mr. Fletcher on the good work thus far done, and earnestly hope that he may be able to carry to a successful issue the plans laid out for the present year.

Eighth Report of Observations on Injurious Insects and Common Farm Pests, with Methods of Prevention and Remedy, by Eleanor A. Ormerod, Dunster Lodge, near Isleworth, England; 8 vo., pp. 122, with 39 cuts. Published by Simpkin, Marshall & Co., Stationers, Hall Court, London, England.

We are much indebted to the talented authoress for a copy of this valuable report, which is in no respect behind its predecessors. In the preface reference is made to the relations of birds to insects, wherein the sparrow is condemned very strongly. Its habit of driving away other and more useful birds, together with its grain-feeding propensities, are fully recognized in England as well as in this country, and fairly entitle it to be regarded as an enemy rather than a friend. More extended reference is made to this subject in a chapter headed "Birds, Depredations of Spar-

rows." The insects which have proved injurious to the following fruits, vegetables, trees, etc., during the past year, together with the best methods of preventing their ravages, are also treated of in the following order: Apple, beans, cabbage, carrots, corn and grass, gooseberry, hop, mangold, oak, onions, parsley, pine, potatoes, raspberry, turnip and willow. The report also contains chapters on marsh snails and the ox bot-fly. Miss Ormerod has succeeded in awakening much interest in England on the subject of injurious insects, and by her careful observations and experiments has conferred lasting benefits on the agricultural community.

CORRESPONDENCE.

Dear Sir: On page 113 of the present volume I stated erroneously that in neither of Mr. Scudder's lists of food-plants was willow attributed to *P. Turnus*. In "Butterflies," p. 309, willow is given. It is however an exceptional food-plant. W. H. EDWARDS.

COELOPA FRIGIDA, FALLEN.

Dear Sir: The occurrence of this fly (which is common along the shores of northern Europe) in N. America, was known long ago. It is always found where *Fucus vesiculosus* abounds. Nevertheless its previous stages seem to be still unknown, and it is the intention of this note to draw attention to this fact and to invite readers to fill this gap. Mr. J. H. Sears, of Salem, Mass., collected the flies in tide pools at Marblehead, Mass., Nov. 30, 1884. In 1877 I received a large number raised in the cellar of the chemical laboratory of Harvard College, Nov. 6. There had been stored a large quantity of fresh sea weeds for chemical examination. I think it is to be supposed that the larva lives not only in the dry dead sea-weed, but probably also in the living. The species would then be an addition to our known marine insects. After Zetterstedt, this species is identical with Doumerc's *Psallidomyia fucicola*, but I cannot consult this paper. Schiner, vol. ii., p. 319, says, *Metamorphosis ignota.* I would be glad to be informed about the previous stages of this species, or—if they are published to know the author. What is known about the previous stages of the Diptera has not yet been collected, and is so scattered in different papers that it is very difficult to find if the metamorphosis of a given species is known and published.

H. A. HAGEN, Cambridge, Mass.

The Canadian Entomologist.

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MONOGRAPH OF THE EMBIDINA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

1. *Oligotoma Cubana*, n. sp.

Olyntha? spec. larva. Hag. Synops. Neur. N. Amer., p. 7.

Olyntha Cubana, larva, imago, Hag. Psoc. Embid. Synops. Verh. Wien. Z. B. Gesell. 1866, p. 221, 223 (no description).

Olyntha Cubana, McLachl. Linn. Soc. Jour. Zool., vol. xiii., p. 381.

Male, dry. Length of body about 8 mill.; exp. of wings about 12 mill. Head light brown, little longer than broad, narrowed behind the eyes, convex above, without any impression, rounded at the sides, cut straight near prothorax; labrum large, paler, rounded; antennæ pale brown (only 13 joints present); 1st large, cylindrical; 2nd very short, as long as broad; 3rd as long as 1st, thinner, somewhat thicker at tip; all following similar but a little shorter; antennæ and head densely clothed with very pale hairs; maxillary palpi 5-jointed, pale brown, apical joint long, conical; labial palpi small; tip of mandibles black. Prothorax light brown, narrower than head, somewhat enlarged to the mesothorax, one half longer than broad, flattened; before the apical third with a transversal sulcus; legs brown, paler on articulations; fore legs with tibia and 1st joint of tarsus enlarged. Wings narrow, faintly rugose, very pale brown, with five longitudinal white bands; radius yellowish; sector bifid; five transversals between the upper branch and the radius. Abdomen long, brown, hairy; appendages long, slender, hairy. The specimen is carded, and the parts not very discernible. If there is a difference, the basal joint of the left appendage is larger, and the apical joint of the right appendage is longer; between both above a short bent process, and on the left side of it a conical lobe, short, open at tip.

Hab. Cuba. The only specimen I received May, 1865, from Prof. Poey. It is No. 8 of his catalogue, and was named as *Olyntha* probably

after the notice in my Synopsis, p. 7, where a larva from Cuba was mentioned as perhaps belonging to *Olyntha?* I think the specimen, when caught, was young; it can not be decided if the colors are fully developed; it is carded and in a delicate condition. It is of the size of *E. Salvini* McLachl., dut directly to be recognized as a different species by the bifid sector of the wings.

Oligotoma Cubana,

Female? about 7 mill. long; dry. Head light brown, sparingly clothed with pale hairs; shape of the male; antennæ brown, densely clothed with pale hairs, 18 jointed; 1st stout, longer, 2nd very short, 3rd longer, all the following shorter, equal; the last one pointed; palpi as in the male; prothorax similar to the male, light brown; thorax and abdomen blackish brown (by exsiccation); meso and metathorax nearly equal, oblong, without any trace of wings; legs dark brown, articulation and tarsi pale; last ventral segment of abdomen not divided, lightly rounded on tip; of the appendages only the left one is present, but the tip of the apical joint is broken; the basal joint is not dilated; above, between the appendages, is a small, thin. elongated lobe.

Hab. Cuba; only one specimen carded and in bad condition, No. 136 of Gundlach's catalogue was received in 1866. If Mr. Wood-Mason's statements are to be accepted, it can be the female to the male described before. Should it be a female larva, which I scarcely believe it to be, it must belong to another and much larger species. The small larva quoted in my synopsis, p. 7, 4 mill. long, from the Museum in Berlin, was also received by Gundlach from Cuba. Probably it belongs to the same species, and is a larva.

2. *Oligotoma Hubbardi,* n. spec.

Length of the body 4 mill.; length to tip of wings 6 mill.; exp. of wings 8 mill. Male dry: Head very light brown, shining; on the sides very sparingly clothed with pale hairs; convex above, slightly narrower behind the eyes, which are black and comparatively larger than in *O. Cubana,* and less distant one from the other above; the part of the head behind the eyes a little broader than long, rounded behind, cut straight before the prothorax; antennæ (5 basal joints present) pale brown, densely clothed with pale long hairs; 1st joint short, cylindrical, scarcely longer than broad; 2nd very small, thinner, annular; 3rd as long as the two

basals, thicker on tip; 4th and 5th similar to 3rd, but a little shorter; prothorax very small, much broader near the wings, divided by an anterior transversal sulcus; legs as in *O. Cubana;* wings very delicate (probably the specimen has been in alcohol, as the wings are crumpled) pale; venation as in *O. Cubana*, sector bifid; transversals not well visible; only indications of the white bands; abdomen pale brown; appendages broken. From what is to be seen of the tip of abdomen, the specimen is a male.

Hab. Entreprise, Florida, May 24, by H. G. Hubbard, to whom the Museum is greatly indebted for interesting specimens and other beautiful biological discoveries.

This is, as far as I know, the only specimen of an Embid collected in the U. S. It is in bad condition, and the description will have to be completed from other specimens. Though the species is obviously related to *O Cubana*, I believe the differences noted in the shape of the head and the antennæ, and the remarkably smaller size, justify the consideration of *O. Hubbardi* as a different species, till the contrary is proved. Difference in size has been noted, but never to such an extent. I possess only of one species eight specimens, which show differences in size, but only small ones.

3. *Oligotoma insularis.*

O. insularis McLachl., Ann. Mag. N. H., 1883, vol. xii., p. 227.

Length of body 8 mill.; exp. of wings, 12 mill.

Male, in alcohol: Body pitchy-fuscous, clothed with fine whitish pubescence; head a little longer than broad; sides oblique; occiput half as broad as the front part; eyes black, a little more distant one from the other than its diameter; in the middle, a little before the eyes, a small transversal impression, perhaps homologous to the obliterated ocellus in *Blatta* and *Termes*. Antennæ (only 10 joints present) fuscous, the articulations pale, whitish; 1st joint stouter than the others, a little longer than broad; 2nd very short, annular; 3rd twice as long as 2nd, a little larger on tip; 4th and 5th shorter than 3rd; 6th as long as 3rd, the following ones longer, more enlarged on tip; mouth-parts a little paler; maxillary palpi fuscous, articulations pale, apical joint ovoid, longer than the other ones, which are of equal length; labial palpi similar, apical joint ovoid, longer than the two basals. Prothorax oblong, as broad as the occiput, a little longer than broad, on each side notched after the transversal sulcus. Legs pitchy-fuscous, the articulations and tarsi pale,

except the enlarged basal joint of the fore legs, which is pitchy-fuscous. Abdomen pale dirty brown ; the ventral ganglions very visible ; last ventral segment dark brown, strong, ending in a bottle-shaped tube, somewhat contracted before its round opening ; this tube is turned to the left side and partly surrounded by a horny hook originating between the left appendage and the tube, on which it is laying somewhat in the shape of a cornucopia. On the right side near the right appendage is a similar hook, but larger and more dorsal, as long as the tube ; the basal half of it forms a spoon-shaped lobe, the apical third is analogous to the left hook, the tip bent up sharply ; before tip inside a kind of blunt tooth ; appendages long, the apical joint as long as the basal ; the left appendage has the basal joint perhaps a little thicker at base ; there is very little asymmetry if at all, in the appendages.

Wings narrow, pale fuliginous ; radius dark fuscous, venation fuscescent ; sector bifurcated, four transversals between its upper branch and the radius ; three costals in the apical half of wing, the last one best defined ; there are five longitudinal whitish bands in the wing.

Hab. One specimen from Honolulu. Mr. Hoffman, who owns a very large botanical garden there, containing many species of palms and orchids, had given orders to collect insects in his greenhouses. Among this miscellaneous lot was one *Oligotoma*. McLachlan's description is made from three carded specimens from the Hawaiian Islands ; though it is difficult to compare dry and alcoholic specimens, it seems to be very probable that my specimen is *O. insularis*. The only difference of importance, the shape of the prothorax, may be the effect of exsiccation. A specimen from Antigua, in McLachlan's collection, is so similar to *O. insularis* that he hesitates to separate it therefrom. Perhaps the latter may be *O. Cubana*. Finally, a richer material will have to decide if *O. Cubana* is really different from *O. insularis*. The only specimen of the latter species before me is more delicate, the wings narrower, the colors much darker, the prothorax larger and different. It could have been imported into the Sandwich Islands with plants, just as other American insects.

4. *Oligotoma Saundersii*.

O. Saundersii, Westwood. Trans. Linn. Soc., vol. xvii., p. 373, pl. 2, f. 2.

O. Saundersii, Burm. Hde., vol. ii., p. 770.

O. Saundersii, Walker. List. Neuropt. Br. Mus., p. 531.

O. Saundersii, Wood-Mason. Contrib. Embid. Proc. Zool. Soc. Lond., 1883, p. 628-634, pl. lvi., f. 1-5.

O. Saundersii, Conry. Ascension Isl. Zool. Ann. Mag., N. H., 1881, vol. viii., p. 346.

Embia Latreillii, Ramb. Neuropt., p. 312-2.

E. Latreillii, Lucas. Ann. Soc. Ent. Fr., 1883, vol. iii. Bullet, p. cvi.

The species was described fifty years ago by Westwood : " Lutescenti-fuscescens, incisuris abdominalibus dilutioribus, alis pallide fuscescentibus, vittis 5 angustissimis albis longitudinalibus inter nervos longitudinales positis." The only known specimen from Bengal, formerly in W. Saunders' collection, belongs now to the British Museum. Burmeister, who had not seen the specimen, changed the color to " testaceofuscescens," which was copied by Walker, though the type was accessible to him. Rambur remarks that he had separated his *E. Latreillii* with 18-jointed antennæ from *O. Saundersii* with 11-jointed antennæ, only for this difference. I believe that McLachlan is perfectly correct in assuming the antennæ of the type imperfect and the identity of both species doubtless. (Journal Linn. Soc. xiii., p. 379.) He remarks, l. c., " in some examples there is a slender spiniform process between the articulate side processes (appendages) ; in *O. Saundersii* this spiniform process has a small tooth before the apex on the lower side. I do not see the process in all the examples, hence it may perhaps be sexual, and possibly is the intromittent organ." (McLachl.)

The 8 alcoholic specimens before me show all this process on the right side, but on the left side is a similar process, which in dry specimens is not well visible. Between both the last ventral segment is protruded asymmetrically to the left in a bottle-shaped cone, with a round aperture on tip. This is as in some Perlids and Phryganids the opening of the ductus ejaculatorius, representing the intromittent organ ; the spines or similar organs have the purpose to open the female valves and to keep them in place during copulation. In *O. Saundersii* these spines viewed from beside are small bands, rounded on tip, with a small hook outside before tip ; this hook is wanting on the left spine, which is also in other species more or less asymmetrical.

McLachlan has not described *O. Saundersii*, but he notes (by *O. insularis)* that the body is testaceous.

Mr. Wood-Mason found in July at Jubbulpore, E. India, a number of larvæ on a sandy spot, which were determined by McLachlan, Proc. Ent. Soc., 1879, p. 53, as possibly belonging to *O. Saundersii*. They show not the slightest traces of wings, although the asymmetry of the caudal appendages is quite apparent. Later winged specimens, being undoubtedly *O. Saundersii*, were captured; all were males of the same uniform brown color. The male sexual characters of alcoholic specimens are described. The abdominal asymmetry is carried to an extreme; not only are the caudal appendages unequal on the two sides, but the tenth dorsal and the ninth ventral segment also depart widely from symmetry, especially the former, which is incompletely divided by a deep angular notch into two unequal and greatly dissimilar parts (Wood-Mason, l. c., p. 632). The wings are described and figured in detail.

This is in fact all known about this species, except the communication by Mr. Lucas, to be recorded later. I received from S. E. Borneo eight specimens, collected in September and December. All are winged males. Their different color induced me to name them as a new species, *O. Borneensis*, especially as mine are well preserved in alcohol, and Wood-Mason's, of the same uniform brown color, were also in alcohol. Thirty years ago I twice studied the type of *O. Saundersii*, which was in good condition, and also the type of *E. Latreillii*, Ramb. As I do not find my notes, I believe it more prudent to unite the Borneo specimens with *O. Saundersii*, the more so as Rambur's description agrees.

Male imago: Length, with wings, 7-10 mill.; exp. of wings 11-16 mill. Head little longer than broad, behind the eyes rounded, about semi-circular; lightly convex above, hairy; yellowish-orange, the front part to behind the eyes dark reddish brown; clypeus pale; labrum pale, with a large brown middle-spot; max. palpi brown, articulations pale, the two apical joints a little longer than the three basals together; these are equal, as long as broad; apical joint ovoid, a little longer than the preceding one; labial palpi similar in color, apical joint ovoid, larger and a little longer than the two basals together. Antennæ much longer than the head, reaching the metathorax, densely hairy, 19-jointed (only one specimen has so many joints), brown, articulations paler; basal joint blackish, a little thicker, cylindrical; 2nd very short, 3rd longer than 1st, ob-conical; the next two or three joints equal, shorter than 3rd; all the rest as long and thick as 3rd. Prothorax much narrower than the head, longer than broad, with a transversal sulcus after the apical third, where the sides are

notched ; yellowish, paler than the head ; the other parts of the thorax and the abdomen more or less dark fuscous, with paler articulations. Legs fuscous, the articulations, the tarsi except of the front legs, and beneath paler. Wings fuliginous, villous, with five longitudinal narrow white bands ; sector bifid ; in the cell four to two transversals, and mostly two between the costa and the end of the cell. Appendages fuscous, stout, two jointed, of equal length, hairy ; basal joint of left appendage much thinner at base and strongly enlarged on tip internally ; basal joint of right appendage stout, cylindrical. The last dorsal segment somewhat cleft and deeply notched from the middle to the right side margin ; in this place is inserted, with a largely inflated base, somewhat above the right appendage, a brown spiniform process ; viewed from above the base is membranaceous paler ; the process is horny, long, narrow (viewed from sides, rounded on tip), bifid at base, going outside of the membranaceous base, and sending the branch to the inner side ; the inner branch and the process form a crescent, which is filled with a pale membrane, which on tip goes outside upon the process and forms a small sharp tooth ; near the left appendage is a similar horny process, but without an inflated base, originating directly from the apical border of the segment ; this process is shorter, a small lobe, similar to the other, ending (viewed from above) knife-shaped ; between and beneath these processes is the last ventral segment produced in a cone, turned to the left side, with a round open aperture on tip.

Mr. Lucas, l. c., has given a very interesting note concerning the larvæ (?) and the habits of *E. Latreillii*. As Mr. Lucas, at the time of his publication, could not have had knowledge of Mr. Wood-Mason's article, it is still uncertain if the so-called larvæ were really larvæ or females. As Mr. Lucas has not recorded the number of joints of the antennæ, nor the asymmetry or symmetry of the appendages, we should better wait to express an opinion till these gaps are filled. The size of the larva is just the same as the male imago (8-10 mill.), therefore too small for a female, if Mr. Wood-Mason's suggestion is correct. The last dorsal segment is said to have a "petite fossette longitudinale," which would agree only with the male. The detailed description of these larvæ agrees well with *E. Latreillii*, and as the author has found among them the winged (male) imago, it will probably be that the described wingless forms were larvæ of the male. They were found by Mr. G. A. Foujade among the detritus of Cycas sent from Madagascar to the Museum of Paris. Larva and imago

live near the base of the leaves of Cycas, concealed in silken tunnels, woven by larvæ and imago. Mr. Lucas believes that this is the only instance known, that full grown imagos possess the power of spinning webs with the mouth; but the same fact is recorded long ago by P. Huber (Mem. Soc. Physiq. Genève, 1843, vol. x., p. 35-47) and other observers for *Psocus*. This faculty of spinning speaks for a relationship of Embidæ and Psocidæ.

Hab. Bengal, the type of *O. Saundersii;* Jubbulpore, between Bombay and Calcutta, end of July, 1879, and Calcutta, flying to the light in the dining-room, by Wood-Mason. *E. Latriellii* is recorded from Bombay, Mauritius Isl. and Madagascar; from Borneo, near Tumbang-Hiang, Sept., 1881, and from Telang, Dec, 1881. Both localities are in the south eastern part of Borneo. The insects were collected by Mr. Grabowsky. Both lots are in alcohol, and the specimens collected in December have exactly the same colors as those collected in September; all are winged males, and apparently identical with *E. Latreillii*. Perhaps the Calcutta specimens of *O. Saundersii* belong to the same species (McLachl. Record, 1883, Ins., p. 259), nevertheless the statement "all of the same *uniform* brown color," is rather suspicious. Mr. Corny, l. c., says that *O. Saundersii* is doing much mischief in Ascension Island; it is to be regretted that not more of the kind of mischief is recorded. The distribution of the species is a wide one; the habits of the species are only recorded by Lucas. In Jubbulpore Wood-Mason recorded them running actively by dozens (all male larvæ) on a bare and sandy spot, beneath old bricks, or openly. A violent thunder storm prevented the examination of the nest or tunnels inhabited by the insects. Mr. Westwood, l. c., p. 374, has seen a small apterous specimen of a dark brown color with a fulcous head, collected by R. Templeton on the Island of Mauritius. Probably it belongs to *E. Latreillii*.

5. *Oligotoma Michaeli.*

Embia spec.—Michael, Gardener's Chronicle, No. 157, vol. vi. (n. ser.) December 30, 1876, p. 845, fig. 156, orchid root eaten; f. 157, Embia magnified, antenna; f. 158, details of the structure of Embia; follows a notice by Mr. J. O. Westwood.

McLachlan, Gard. Chronicle, in a following number.

Oligotoma Michaeli McLachlan, Journal Linn. Soc. Lond. Zool., vol. 13, p. 373-384, pl. xxi.

Oligotoma Michaeli Wood-Mason, Proc. Zool. Soc. Lond., 1883, p. 630, pl. lvi., f. 6, female.

Mr. Michael, of Highgate, England, an extensive grower of exotic orchids, discovered in 1876 that a large mass of *Saccolobium retusum*, purchased from a London nurseryman, was apparently damaged by some insect, and examination revealed the presence of numerous Embidæ on the roots, concealed in silken tunnels. A winged example was unfortunately lost. More specimens were found in the nursery whence the plants were obtained. Mr. Michael gave an account of the discovery, illustrated by magnified figures, and accompanied by notes of Prof. Westwood, in which a doubt was implied as to the damage to the orchids being occasioned by the Embidæ. Mr. McLachlan, l. c., stated that Prof. Westwood's doubt appeared to be well founded. But the sequel proved, tolerably to his satisfaction, that the insects had eaten the roots to some extent. About the same time he received from W. A. Forbes a full grown larva without traces of rudimentary wings. Mr. Michael's figure shows a larva with only short rudimentary metathoracic wings, and McLachlan supposes that the mesothoracic pair may have been accidentally destroyed. McLachlan describes the species as *Oligotoma Michaeli*, and figures larva, nympha and imago. I should remark that all the foregoing is copied from McLachlan's excellent paper, though I have myself compared the quoted communications. Mr. Wood Mason, l. c., found in October, 1880, in the large plant house in the Botanic Gardens in Calcutta, a large wingless Embia crawling over the leaves of a plant, which he describes carefully and declares it to be the long sought for female. He does not give its name, except in the explanation of the plate, p. 634, where the figured abdomen, f. 6, is stated to be Embia *(O.) Michaeli.* He speaks, p. 631, of a black winged specimen different from his *O. Saundersii* collected in Calcutta, but he gives no description nor a name. I have received by Rev. C. C. Carleton, from Amballa, *E. India*, a female apparently identical with those described by Mr. Wood-Mason, and a small black-winged male. Both were in alcohol, together with numerous other insects, without any notes concerning their habits. I presume the male to be *O. Michaeli.*

McLachlan's descriptions are as follows:

Male, imago: Length of body 10½ mill.; exp. of wings, 18.

Deep black, somewhat shining; antennæ 24-jointed, the five apicals yellowish; legs black, knees and tarsi somewhat testaceous; append-

ages black, long, very asymmetrical; the right with the basal joint very broad, nearly quadrate; the left slender, and fully twice as long; a slender process with piceous apex from the base of the right appendage; ventrally is a large triangular projection of the last segment, concave above; wings dark smoky fuscous, with four very narrow longitudinal lines; 4–5 pale costal veinlets and three between the radius and the upper branch of the sector.

A well-grown larva is 12 mill. long; antennæ much shorter than in the imago; lurid-fuscous, the posterior portion of the head, the whole prothorax and legs more or less testaceous; underside pale; appendages with just the same asymmetry as in the imago. A starved nymph 9 mill. long; colors similar to those of the larva; legs more slender, asymmetry of caudal appendages less striking; rudimentary wings with evident neuration; fore wings reaching the base of metanotum; hind wings the apex of 2nd dorsal segment; the nymph when living was at least one-third longer. Hab. Among plants of *Saccolobium retusum* from East India in hothouses.

The three stages are described after single specimens. The color of the larva reminds strongly of the specimens from Borneo, described before as *O. Saundersii.* The figure of the nymph in the Gardener's Chronicle complicates things more. The hind wings cover only the anterior half of the metathorax, therefore the specimen was much younger than those described by McLachlan, in which the hind wings reached the apex of the second abdominal segment. Nevertheless the size marked in the Gardener's Chronicle is 16 mill., though McLachlan's when living, was only 12 mill. The figure (Gard. Chr.) shows on the hind part of the head and thorax spots and patches similar to those in Sialis and Corydalis. Mr. Wood-Mason speaks in several places of *O. Michaeli* as if he knows this species, and finally described and figured (only the abdomen from below) *O. Michaeli.* Nevertheless his paper does not allow conclusions with certainty. The black male mentioned by him can only with doubt be united with *O. Michaeli*, as he does not mention the yellow apex of the antennæ; in fact he has not named it at all. The female, of which I possess a specimen, seems rather gigantic compared with the described male, so that I had provisionally described it as *O. valida.* But as McLachlan (Zool. Rec., 1883, p. 259) by the words in brackets, "apparently *O. Michaeli* McLachl.," accepts this determination, I have followed him not to encumber synonymy.

Female: Length of body 1S mill.; breadth 2 mill. Head nearly circular, convex above, blackish fuscous, reddish in the centre, densely covered with short reddish hairs; eyes very small, below and a little behind the antennæ, scarcely visible from above, kidney-shaped; facets less numerous, smaller and not convex, as in the males; indeed the eyes of the female are compound, flattened eyes, though those of the males are nearly aggregated eyes; clypeus short, transversal, somewhat reddish; rhinarium large pale membranaceous; labrum large, rounded, light brown, darker in middle; maxillary palpi very pale brown, the two last joints longer; labial palpi same color, last joint longer; head beneath, blackish, fuscous reddish in the middle; mentum transversal, quadrangular blackish fuscous. Antennæ (only 21 joints present) short, perhaps as long as the head, blackish fuscous, hairy, articulations pale; 1st joint thicker than the others, cylindrical, less than twice as long as broad; 2nd as long as broad, 3rd very little longer, 4th to 6th very short, annular; the seven following alike, about globular, the rest longer, ovid. Prothorax about as broad as the head, quadrangular, a transversal sulcus after the apical third, and a smaller one on the base; mesothorax about twice as long as broad, a transversal sulcus near the base; metathorax as long as broad, quadrangular; no traces of wings; the 10 dorsal segments of abdomen alike, a little shorter than broad, except the last one, which is longer, rounded on tip, obtuse, deflexed at the end. The first 6 ventral segments alike, half as long as broad; 7th shorter, the apical margin widely emarginated, the middle forming a small transverse-oval plate, behind which is to be seen the large genital aperture in the articulation of the segments; 8th segment a little longer; 9th split longitudinally in two lobes for the anus. Thorax and abdomen shining black and remarkable for its thick and firmly chitinized integument; below a little paler, brownish, and as commonly the nerves of the chorda ventralis can be recognized through the integument. Appendages symmetrical, two-jointed, cylindrical, apical joint a little longer and thinner; blackish fuscous, pale on articulations, femora and first joint of fore-tarsi strongly enlarged; middle legs less strong and smaller; the inflated 1st joint of the tarsus of fore legs with an external apical black spine, longer than the 2nd joint.

Hab. Amballa, *E. India*, by Rev. C. C. Carleton, one specimen in alcohol. There can scarcely be any doubt that it is the female of *O. Michaeli* described by Mr. Wood-Mason. The difference of the situation of the genital aperture at the base of 8th segment (he says the 9th) is only

seemingly, as he counts the "segment médiaire," of which he says, p. 630, "its sternum appears to be undeveloped." He calls the antennæ pale-tipped. Perhaps this belongs, as in the male, to the apical joints, which are wanting in my specimen.

It is doubtless true that the specimen just described is a female, as Mr. Wood-Mason has well proven by the location of the genital aperture between the 7th and 8th ventral segments; also that it is a full-grown female, as proven by the firmly chitinized integuments. How Mr. Wood-Mason arrived at the previous conclusion, that the females of Embia would be apterous, I do not know; though his supposition that the female would be probably larger in size, was justified by related families. In accepting solely on the high authority of Mr. Wood-Mason and Mr. McLachlan that this female belongs to *O. Michaeli*, it seems important to point out the differences of the male (after the description and figure by McLachlan) and the female.

1. The difference in size is very great, body of the female being at least one third longer, and half broader.

2. The female is perfectly wingless; no traces of rudimentary wings to be found at the anterior angles of the two thoracic segments. There seems to be indeed at the anterior angles a little below the dorsal plate, a very small hyaline membranous sac, but the insufficient material at hand would not justify the accepting of these sacs as traces of aborted wings.

3. The difference between the eyes of the male and the female is very striking, though not noticed by the author. The male has large eyes, prominent on the sides of the head, very visible from above, kidney shaped, and the socket of the antennæ placed in the emargination; the facets are globular. The female has the eyes much smaller, scarcely visible from above, below and behind the antennæ, from which they are wider separated; the hind part of the eye is about half broader than the front part; no inner emargination exists; the facets are smaller and flattened. The eyes of the male are more like aggregated eyes (Stylops), the eyes of the female are like the common compounded eyes of insects. The consequences of these differences are very visible in the shape of the head. The largest diameter of the head of the males is situated between the eyes; behind them the sides of the head slope down to the occiput. The head of the female is nearly orbicular, or at least very shortly ovoid. A sexual difference of the eyes does not exist, as far as known to me, among the Perlids, but very often in Psocids and Ephemerids.

4. The antennæ seem to be shorter and the joints partly more globular in the female, a character not uncommon among the Psocids.

5. The difference of the meso- and metathorax among the sexes is not much marked, owing probably to the fact that the wings of the male imago are inserted with a very narrow base, which gives a very fine membranous fold farther down along the sides. The sternum of each of the three segments of the thorax is divided in three parts. The segment médiaire is the last part of the metathorax, and the dorsum of this segment belongs to the metathorax. The abdomen has only seemingly 10 dorsal segments.

6. The apex of the first tarsal joint of the fore legs of the female has an external spine, longer than the second joint, conical, very sharp. I have not yet fouud such a spine in any male.

7. The anal appendages of the abdomen are symmetrical in the female ; asymmetrical in the male, similar to Blatta. I do not know that a similar asymmetry exists among Pseudoneuroptera.

I am at a loss to understand where the larva described, p. 384, fig. 1, by McLachlan, belongs. The whole figure represents well a younger female only 12 mill. long, except that the eyes are a little larger and more visible from above. The description states, "just the same asymmetry as in the imago." This would indicate a positive difference. But there is not to be seen in the figure any asymmetry, and the segment before the last seems to be shorter. The description mentions not the ventral parts, which would be deciding. If it is not a female—and it can hardly be assumed that younger females should possess asymmetrical appendages—it can not be a male larva, being longer than the largest male imago, and not showing the slightest traces of wings. Perhaps a new examination of the type will solve the question. I can not accept the starved nymph, p. 384, fig. 2, as a nymph. The wing cases of nymphæ in Orthoptera (and Pseudoneuroptera) are always more or less connected at base, and never entirely free as in the figure. Perhaps the specimen represents a so-called short-winged form, which occurs not uncommonly among Perlids, Psocides and Termites. The figure in Gard. Chronicle (fig. 157) would represent a female (the external spine of the first tarsal joint of the fore legs is visible) if the wing sacs of the metathorax were not so well marked.

There is apparently more detailed information needed on *O. Michaeli*. As the large orchid growers here are accustomed to buy their East Indian species mostly from London nurseries, I have taken steps to ascertain if any Embids have been imported with the plants.

Male imago : Length 8½ mill.; exp. of the wings 12 mill.

There is before me one specimen from Amballa, *E. India*, by the same collector, Rev. C. C. Carleton. It did not arrive in the same lot with the female, but several years before in alcohol, together with many other insects. The very large discrepancy in size of the female, and the considerably larger size of the male described by McLachlan, though his specimen was dry, together with some differences with the description, seemed to justify my specimen as a new species, perhaps identical with the black one from Calcutta, mentioned without description by Wood-Mason. Nevertheless, some of the differences may be the result of the drying up of the specimen described, and therefore I decided to accept the specimen as a small *O. Michaeli* till the contrary is proved. It differs as follows from McLachlan's description :

There is no large, nearly circular, shallow depression on the disc of the head above ; but between the eyes is a short engraved furrow, similar to an aborted ocellus. Antennæ brown with paler hairs, instead of black with black hairs ; what remains, 17 joints, is considerably longer than the head and prothorax together ; shape of joints as in the description; I do not know if the five apicals were yellow, ; when I figured years ago the details of the specimen, and counted 21 joints, I did not note in the description that the two last joints were yellow. The pronotum is not nearly twice as long as broad ; after the straight front margin and transversal sulcus, there follows a somewhat diamond-shaped elevation, and the base after it is membranous. Legs, wings and veins as in the description ; the only black vein is the subcosta, which, as Wood-Mason justly remarks, is not coalescent with the radius ; all other veins are brown. The wings have indeed five white longitudinal lines, only the first one behind the costa is very narrow. Appendages long, asymmetrical, brown, with long black hairs, the basal joint of the right one long, broad, straight, but by no means nearly quadrate, as in the decription ; the left is a little longer, slender, thinner at base, curvated ; the apical joints alike, cylindrical, straight, about as long as the basal joint. The last ventral plate is asymmetrical ; somewhat more to the right originates with a larger base a cylindrical tube, straight, but turned a little to the left ; shortly before its apical opening it is a little constricted ; between it and the right appendages is a slender process, as long as the tube, cylindrical, its apical half thinner, tip pointed ; on the left side, between tube and appendages, is a process with thicker membranous base, the apical half slender, much

twisted, sharp on tip, much shorter than the tube. I believe it probable that the difference mentioned may be explained from the fact that McLachlan had before him only a dry specimen, and I only one in alcohol. As soon as this species can be more easily got for study, we may hope to have detailed descriptions from a larger material.

DESCRIPTION OF THE LAST LARVAL STAGES AND CHRYSALIS OF MELITAEA RUBICUNDA, H. Edw.

BY W. H. EDWARDS, COALBURGH, W. VA.

On 13th Sept., 1884, I received from Mr. James Fletcher 22 larvæ in hibernation, part of a lot sent him shortly before by Rev. Geo. W. Taylor, of Victoria, V. I. The larvæ, on exposure to the light, moved about, but refused to eat Chelone glabra. I placed them in cellar, and in October forwarded to Clifton Springs, N. Y., with larvæ of other species, to go in the "cooler." On 7th March, I received them again, and found about one half to be alive. These I put in the ice house till I could get leaves of the food-plant. In last days of April they were brought to the house and given Chelone, the living larvæ now being reduced to six. On the third day, I noticed that the leaves had been eaten, and three or four days later the larvæ looked healthy and had recovered the length and diameter which they had on 13th Sept., larvæ always shrinking much during hibernation. The description then taken is as follows:

After supposed third moult: Length $\frac{1}{5}$ inch; cylindrical, rather thickest in middle, and tapering equally to either end; color black and gray-white; a mid-dorsal band of the latter color, cut longitudinally by a black line; then a broad black band reaching to middle of side, dotted with gray on the tops of the cross-ridges; below this to base about equally black and gray, sprinkled and mottled; the spines arranged as in the allied species, there being seven principal rows, one dorsal, and three on either side, besides a row of minute ones along base; these upper spines are rather long, broad at base and taper to a blunt top, and are beset thickly from base to top with long black hairs; the dorsal row spring from large orange tubercles, and for a little distance above are orange, the rest black; the other rows have black tubercles and the spines are black,

except that in the lower lateral row, from 6 to 10, there is a little orange on the outer side of each tubercle; the small spines of row along base are orange, from orange tubercles; segment 2 has a black chitinous dorsal collar on which are many small black spines, with hairs; feet black; pro-legs black, the last joint yellowish; head ob-ovoid, flattened frontally, depressed at suture, the vertices rounded; color dull black, the surface rough, thickly covered with long black hairs.

On 2nd May, one larva passed the first moult after hibernation, the supposed fourth moult. At 24 hours from the moult: length $\frac{5}{10}$ inch. By 10th May, this larva had reached maturity.

Mature Larva.—Length .9 inch; cylindrical, thickest in middle; color black, with a slight dorsal band of gray-white, made up of white tubercles on the cross ridges, and a heavier band of same color along lower part of side, the black area between the two being thinly dotted white; the spines long, stout at base, tapering, and thickly beset with long black hairs; those of dorsal row black at tips, the rest and the large basal tubercles, yolk-yellow; those of the other three rows black, the bases black; the small spines along base of body yolk-yellow on 6 to 10, the rest black; on 2 a chitinous collar with many small black spines with hairs; feet black, pro-legs black, the last joint yellowish; head ob-ovoid, flattened in front, depressed at top, the vertices rounded; surface rough with many long, black hairs; color dead black.

On 12th the larva suspended, and at 8 p. m., 13th, pupated. From last moult to pupation $11\frac{1}{2}$ days. (In case of other Melitaeas, two moults have occurred between hibernation and pupation.)

Chrysalis.—Length $\frac{5}{10}$ inch; breadth across mesonotum and abdomen $\frac{18}{100}$ in.; shape of *Phaeton;* cylindrical; head case narrow, compressed transversely, excavated at the sides; mesonotum not prominent, rounded, somewhat carinated, followed by a shallow excavation; the tuberculations which correspond to the larval spines and tubercles rounded, raised but little above the surface; color of anterior parts and wing cases dark pearl-gray, marked and spotted with black; of abdomen diluted black dotted with dull white, especially along mid-dorsum, and across same, on the posterior part of each segment, where the dots form parallel rows; the mid-dorsal tubercles orange, making a round spot on the fore part of each segment, and on each spot are two small black spots in cross row; in line with the spiracles, on the anterior side of each, is a slight orange discol-

oration ; along ventral side two rows of small orange spots corresponding to the small basal tubercles of the larva ; the wing case shows a large black patch on disk, also irregularly serrated marginal black spots, and submarginal spots, rounded and sub-lanceolate ; head case largely black ; on anterior part of mesonotum a large black sub-rectangular patch, below which is an arched stripe of black, and under this, at summit, two spots ; on the posterior part two curved demi-bands meeting at the carina.

From this chrysalis came a female butterfly 23rd May. Duration of this stage 10 days.

Another larva went to pupa and imago in Philadelphia, in Mrs. Peart's care. The other larvæ from the first eat little, and some became lethargic, and some of them died. But one seemed healthy and asleep, and 23rd May I returned it to the ice box. From time to time I looked at it ; on 6th July brought it to my room and laid it on Chelone leaf. But as by 8th it had eaten nothing, though it had moved a little in the glass, I replaced it on the ice. As I write, 20th Aug., it is sweetly sleeping. It seems odd that a larva in this climate should go over the second season, as this bids fair to do.

Rubicunda belongs to the *Anicia* sub-group, flies from North California at least to Vancouver Island. I have had mature larvæ of *Anicia* and of *Baroni* (another of this sub-group), and the three species are distinctly different in this stage. They all have similar habits as far as I know them, and probably all will eat the plant of *Phaeton*, Chelone glabra, as *Chalcedon* also does.

INSECTS IN ARCTIC REGIONS.

[Extracted from "Das Insektenleben in Arktischen Landern, von Christopher Aurivillius," forming part of Nordenskiold's "Studien und Forschungen veranlasst durch meine Reisen im hohen Norden :" Leipzig, 1885.]

(From the Entomologist's Monthly Magazine.)

A special interest attaches to the question of the mode of life in insects in relation to their surroundings in high Northern latitudes. Knowing, as we do, that the time available for the development of an insect in the extreme North is limited to from 4 to 6 weeks in the year, one has felt

surprised how it could be possible for certain species to run through all their transformations in so short a time.

R. McLachlan, in his paper on the insects of Grinnell Land (Journ. Linn. Soc., Zoology, vol. xiv.), refers to the difficulties which the shortness of the summer interposes to the development of insects, and intimates his suspicion that a development which would with us take place in a single summer would there require several summers.

The correctness of this suspicion has been completely established by the interesting observations on species of *Lepidoptera* in South Waranger, in latitude 69° 40′, made by G. Sandberg. He was successful in watching the development of some extreme Northern species from the egg.

Let us take as an example *Œneis Bore*, Schn., a true hyperborean butterfly, which has never been found outside the Arctic circle*, and even there only occurs in places which bear a truly Arctic stamp.

The imago flies from the middle of June onwards, and lays its eggs on various species of grass. The eggs are hatched the same summer; the larva hibernates below the surface of the earth, feeds and grows all through the following summer, but does not succeed in attaining its full size; it then hibernates a second time, and does not assume the pupa state till the spring of the following year.

The pupa, which in the allied forms in more southern localities is freely suspended in the air to a grass-stem or some similar object, here reposes in the earth, which in so inclement a climate must evidently be a great advantage.

The butterfly escapes from the pupa-skin after an interval of from 5—6 weeks, a period of unusual length for a diurnal Lepidopteron. In more southern lands the pupal repose of butterflies in summer rarely exceeds a fortnight. Hence, the entire metamorphosis is more tedious than in more temperate regions.

By these and other observations, Sandberg shows that one Arctic summer, in latitude 70°, does not suffice for the development of many *Lepidoptera*, but that two or more summers are required for the purpose.

If, therefore, more than one summer is needful for the development of *Lepidoptera*, it appears to me even more certain that Humble-bees must

* Mr. W. H. Edwards informs us that Mr. David Bruce has taken *Chionobas Taygete* Hub., which is syn. of *Oeneis Bore* Sch., in Colorado, on summits, at high elevation. Mr. Edwards' Catalogue, No. 304, says *Taygete* Hub. = *Bootes* Bd., and Staudinger's Cat. says *Bore* Sch. is the same as these, that is, it is all one species.—Ed. C. E.

require more than one summer. With us it is only the fully developed females which survive from one year to the next; in spring they form the new nest, lay eggs, and bring up the larvæ which develop into workers, and thus begin to contribute to the support of the family, whence at last towards autumn males and females are developed. It seems hardly credible that all this can happen each summer in a similar way at Grinnell Land, in latitude 82°, especially as there the supply of food must be less than with us. Hence, the development of a colony of Humble-bees must there be something quite different.

Were it not satisfactorily established that Humble-bees do occur in such high latitudes, one might, from our knowledge of their mode of life, be disposed to maintain that under such conditions they could not live.

They seem, however, to have one advantage over their more Southern brethren. In the Arctic regions they do not seem to be troubled with parasites, such as *Conops*, *Mutilla*, which help to diminish their numbers in other countries.

BOOK NOTICES.

Revised Catalogue of the Diurnal Lepidoptera of America North of Mexico, by Wm. H. Edwards, 8vo., pp. 95. From Transactions of the American Entomological Society, 1885.

This revised catalogue of American butterflies was greatly needed. Since Mr. Edwards published his first catalogue in 1877, much new material has accumulated, more than a hundred new species have been described, while a vast amount of information has been published on the preparatory stages and habits of these insects. Much of this has been communicated by the author of the catalogue himself, who has brought an amount of enthusiasm to bear on this interesting field of research exceeding that of any of his predecessors or co-laborers, while his full and accurate descriptions have been everywhere appreciated. Other excellent workers have also added to our stock of knowledge in this department, to all of which ready reference is had by the use of this catalogue. The new edition gives fuller references with dates, whereas the former catalogue gave no date. Many corrections are made in the synonymy, the result of a careful scrutiny by the author of every species in the entire list; the localities also are given with greater fullness. A large propor-

tion of the additions to the list of new species are to be found in the Hesperidæ, to which 56 have been added. Many additions have also been made to Melitaea, Thecla and Argynnis. A new and excellent feature is a copious index of genera and species, which will be much appreciated by all who have occasion to consult its pages. In this catalogue the author has given us the full benefit of his long experience and careful study, and has produced a work which will not only commend itself, but will be indispensable to all who are engaged in the study of American butterflies.

CORRESPONDENCE.

Dear Sir: In the last No. of the ENTOMOLOGIST appears a description of *E. Provancheri* by M. L'Abbe Provancher, in which the species is credited to British Columbia. This is a mistake, as the specimens contributed to him, and from which the description was made, were bred from cocoons of *A. Luna*, collected in Muskoka, a little south of Bracebridge, by Mr. R. Mosey, who handed them to me.

W. BRODIE, Toronto.

Dear Sir: On page 107 of the present volume of the CAN. ENT., Mr. Frederick Clarkson gives an account of his "Seaside Captures," and at the close of the paper says: "Among the treasures of the beach I collected several shells perforated in every part by the young of one of the lower order of Crustaceans, and rendered immaculate by the washing of the tide and the sun's rays." A little further on he continues: "The mouth parts of these Sea Worms, or Barnacles, are strong and corneous, and are capable of excavating galleries in the hardest substances."

Mr. Clarkson is in error in ascribing this tunneling of the shells to a Crustacean, for it is the work of a species of sponge (Cliona). If some of the recently cast up shells are broken open, the sponge will be readily seen, and its structure may be examined. It burrows in marble, as he describes, and particularly in the oyster, though also in other shells, such as Natica and Pyrula.

WM. T. DAVIS, Tompkinsville, Staten Island.

The Canadian Entomologist.

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LARVA OF PARASA CHLORIS, H.-Sch.

BY G. H. FRENCH, CARBONDALE, ILL.

Length .50 of an inch, elliptical, as is the usual shape of the Lymacodes group, nearly .20 of an inch high and about the same width. The dorsum has four lines of purplish black alternating with white, and bordered outside with yellowish white or pale yellow. The region of the subdorsal line is a bright vermillion ridge with yellowish white tubercles arising from joints 2, 3, 4, 7, 10 and 12, those on joint 2 moderately short, but those on joints 4 to 12 are nearly one fourth of an inch long; all of them spiny. There are short bunches of spines on the intervening joints, as it were representatives of missing tubercles. In the subdorsal space are four scarlet lines alternating with lines of yellowish white, the middle yellowish line instead of being continuous, consists of alternate blotches of vermilion and yellowish white. The substigmatal line is vermilion, bordered as the subdorsal with pale yellow, and this also has its row of yellowish white spiny tubercles, each about one sixteenth of an inch long. Below this is a single dark purple line bordered each side with a lighter shade, and below this a vermilion line or rather a series of tubercles without spines in place of the prolegs. Legs 6, no prolegs, but the under side of the body consisting of a muscular pad upon which the insect glides along instead of walking. Head brown, retractile when at rest into the joint back of it.

The food plants of this peculiar larva seem to be apple and rose. In 1880 one was brought to me on an apple leaf. This one soon died; but last season, September 18, 1884, another was found on a rose leaf that soon spun its cocoon, but it did not change to a chrysalis till the following spring. As soon as found the larva was placed in a jelly glass, and it spun on the under side of the cover with the cocoon touching the side. When the cover was taken off this broke the cocoon, leaving a small piece attached to the glass. Through this small opening the larva could be seen every time the cover was removed to moisten the contents of the

dish, till after the warm spring weather had roused the most of insect life into activity. The imago appeared July 14, 1885. The cocoon was .50 of an inch long, dark brown, smooth, egg-shaped like the others of the group, and smooth on the inside. The empty pupa skin is thin, pale brown.

A PRELIMINARY LIST OF THE ARTHROGASTRA OF NORTH AMERICA (EXCLUDING MEXICO.)

BY LUCIEN M. UNDERWOOD, PH. D., SYRACUSE, N. Y.

The Arthrogastra of North America have scarcely been studied except in two or three families, the principal part of the American literature consisting of scattered notes and descriptions. Two or three more pretentious papers have been published by Wood, Putnam and Hagen. A broad field for study is open for future investigators. In order to call attention to the group and secure such co-operation of collectors as may be possible, the following preliminary list of twenty genera and fifty-nine species has been prepared. A few forms are added from Lower California and Cuba which will probably be found within the limits of the United States. Additions and corrections to the list are solicited, as well as specimens from all parts of the country, for which a suitable return will be made.

FAMILY PHRYNIDÆ.

1. PHRYNUS, Oliv.

1. P. ASPERATIPES, Wood. Proc. Phila. Acad. 1863, 111 : Jour. Phila. Acad. 2nd series, v., 375 (1874).

Hab. Lower California.

FAMILY THELYPHONIDÆ.

1. THELYPHONUS, Latr.

1. T. GIGANTEUS, Lucas. Magazin de Zoologie (Guerin) 1835. *Wood*, Jour. Phila. Acad., 2nd series, v., 374 (1874).

T. excubitor, Girard, in Marcy's Rep. Exploration Red River, 265, Pl. xvii., fig. 1-4 (1854).

Hab. Southwest United States.

FAMILY SOLPUGIDÆ.

I. DATAMES, Simon.

1. D. FORMIDABILIS, Simon. Annales de la Soc. Entom. de France, ix., 136 (1879).

D. striatus, Putnam. Proc. Davenport Acad., iii. 255, 266, Pl. i., fig. 1, Pl. ii., fig. 7 (1883).

Hab. California, Arizona.

2. D. PALLIPES, Simon. Ann. de la Soc. Entom. de France, ix., 139 (1879). *Putnam*, Proc. Davenport Acad., ii., 184 (1880); Ibid., iii., 267, Pl. i., fig. 6 (1883).

Galeodes pallipes et subulata, Say., in Long's Exped. to Rocky Mts. (1823).

Hab. Kansas, Colorado, Utah, Wyoming, Nevada.

3. D. SULFUREUS, Simon. Ann. de la Soc. Entom. de France, ix., 142 (1879). *Putnam*, Proc. Davenport Acad., iii., 267 (1883).

Hab. Georgia, Texas, Colorado.

4. D. CALIFORNICUS, Simon. Ann. de la Soc. Entom. de France, ix., 143 (1879). *Putnam*, Proc. Davenport Acad., iii., 266, 267, Pl. iv., fig. 32-40 (1883).

Hab. California, Arizona.

5. D. GIRARDII, Putnam. Proc. Davenport Acad., iii., 257, 267, Pl. ii., fig. 12 (1883).

Galeodes subulata, Girard, in Marcy's Rep. Expl. Red River, 241 (1854). (Not *G. subulata*, Say.)

Hab. Texas, New Mexico, Arizona.

6. D. GENICULATUS, Simon. Ann. de la Soc. Entom. de France, ix., 136 (1879). *Putnam*, Proc. Davenport Acad. iii., 268 (1883).

Gluvia geniculata, Koch. Archiv für Naturgesch , viii., 355 (1842).

Hab. Texas.

II. GLUVIA, C. Koch.

1. G. ELONGATA, Koch. Archiv für Naturgeschich., viii., 350-356 (1842). *Putnam*, Proc. Davenport Acad., iii., 268 (1883).

Hab. Texas.

III. CLEOBIS, Simon.

1. C. CUBÆ, Simon. Annales de la Soc. Entom. de France, ix., 149 (1879). *Putnam*, Proc. Davenport Acad., iii. 268, Pl. i., fig. 5 (1883).

Galeodes Cubæ, Lucas, in Histoire physique, politique et naturelle de l'Isle de Cuba, par M. Ramon de la Sagra, Pl. v., fig. 6 (1857).

Cleobis Stimpsoni, Putnam. Proc. Davenport Acad., iii., 261 (1883).

Hab. Florida, Cuba.

FAMILY SCORPIONIDÆ.

I. BUTHUS, Leach.

1. B. BIACULEATUS, Latr., in Coll. de Museum. *Wood* Jour. Phila. Acad., 2nd series, v., 368 (1874).

Hab. Florida.

2. B. BOREUS, Wood, Jour. Phila. Acad., 2nd series, v., 368 (1874).

Scorpio boreus, Girard, in Marcy's Rep. Exploration Red River, 238, Pl. xvii., fig. 5-7 (1854).

Hab. Utah.

3. B. CALIFORNICUS, Wood, Jour. Phila. Acad., 2nd series, v., 364 (1874).

Scorpio Californicus, Girard, in Marcy's Rep. Exploration Red River, 240 (1854).

Hab. California.

4. B. CAROLINIANUS, Wood, Jour. Phila. Acad., 2nd series, v., 363 (1874).

Scorpio Carolinianus, Beauv., Insect. Rec. en Afrique et en Amerique, 190, Pl. v., fig. 3 (1805).

Buthus vittatus, Say., Jour. Phila. Acad., ii., 61 (1821) : Coll. Writings, ii., 11.

? *Scorpio Sayi.* Girard, in Marcy's Exploration Red River, 240 (1854).

? *Væjovis Carolinus*, Koch, Die Arachniden, x., 7, fig. 759.

Hab. So. States, Texas, Kansas.

5. B. EMARGINATICEPS, Wood. Proc. Phila. Acad., 1863, 109 ; Jour. Phila. Acad., 2nd series, v., 367, Pl. 40, fig. 1, 1a, 1b, 1c (1874).

Hab. Lower California.

6. B. EUSTHENEURA [U. S.] Wood. Proc. Phila. Acad., 1863, 109; Jour. Phila. Acad., 2nd series, v., 368 (1874).

Hab. Lower California.

7. B. EXILICAUDA [U. S.] Wood. Proc. Phila. Acad., 1863, 107; Jour. Phila. Acad., 2nd series, v., 366 (1874).

Hab. Lower California.

8. B. HIRSUTUS, Wood. Proc. Phila. Acad., 1863, 108; Jour. Phila. Acad., 2nd series, v., 367, Pl. 40, fig. 1, 1a, 1b, 1c (1874).

Hab. Lower California.

9. B. LESUEURII, Gervais, Archiv du Museum, iii., 226, Pl. xi., fig. 27-29, (1844); Apteres, iii., 61, (1844); *Wood*, Jour. Phila. Acad., 2nd series, v., 365, (1874).

Hab. Cuba.

10. B. PUNCTIPALPI, Wood. Proc. Phila. Acad., 1863, 109; Jour. Phila. Acad., 2nd series, v., 369 (1874).

Hab. Lower California.

11. B. SPINIGERUS, Wood. Proc. Phila. Acad., 1863, 110; Jour. Phila. Acad., 2nd series, v. 370, Pl. 40, fig. 2, 2a, 2b (1874).

Hab. Texas.

II. CENTRURUS, Gervais.

1. C. PHAIODACTYLUS, Wood. Proc. Phila. Acad., 1863, 111; Jour. Phila. Acad., 2nd series, v., 372, Pl. 40, fig. 3, 3a, 3b (1874).

Hab. Utah.

III. SCORPIO, DeGeer.*

1. S. ALLENII, Wood. Proc. Phila. Acad. 1863, 107; Jour. Phila. Acad., 2nd series, v., 372 (1874).

Hab. Lower California.

IV. UROCTONUS, Thorell.

1. U. MORDAX, Thorell. Ann. and Mag. Nat. Hist., xvii., 11.

Hab. California.

* I have omitted from the list DeGeer's species, *S. punctatus*, *S. maculatus*, *S. testaceus*, *S. australis*, as unrecognizable.—Cf. Memoirs Insectes, vii., 343-348.

FAMILY CHERNETIDÆ.

I. CHELIFER, Geoff.

1. C. CANCROIDES, Latr. Hist. Nat. Crust., etc., vii., 141, Pl. 6, fig. 2 (1804). *Hagen*, Record Amer. Entom., 1868, 51; Amer. Nat., ii., 216 (1869); Proc. Boston Soc., N. H., xiii., 264 (1870).

Hab. U. S., generally to California (Simon).

2. C. MURICATUS, Say. Jour. Phila. Acad., ii., 63 (1821); Coll. Writings, ii., 11; *Hagen* Record Amer. Entom., 1868, 51; Proc. Boston Soc., N. H., xiii., 266 (1870).

Hab. "North America" (Say).

3. C. SCABRICULUS, Simon. Ann. de la Soc. Entom. de France, series v., viii., 154 (1878).

Hab. California.

4. C. ACUMINATUS Simon. Ann. de la Soc. Entom. de France, series v., viii., 156 (1878).

Hab. California.

5. C. ALIUS, Leidy. Proc. Phila. Acad., 1877, 261.

Hab. Pennsylvania.

6. C. WRIGHTII, Hagen. Record Amer. Entom., 1868, 52; Proc. Boston Soc., N. H., xiii., 267 (1870).

Hab. Cuba.

II. CHERNES, Menge.*

1. C. OBLONGUS, Hagen. Record of Amer. Entom., 1868, 51; Proc. Boston Soc., N. H., xiii., 268 (1870).

Chelifer oblongus, Say. Jour. Phila. Acad., ii. (1821); Coll. Writings, ii., 12.

Hab. "North America" (Say).

2. C. SANBORNI, Hagen. Record of Amer. Entom., 1868, 51; Proc. Boston Soc., N. H., xiii., 268 (1870).

Hab. Massachusetts.

* Simon reunites the genera *Chelifer* and *Chernes*, which were separated by Menge, who was followed by L. Koch. He claims that the characters hitherto regarded as generic, are merely gradal, and that while certain widely separated species have these characters clearly marked, in others they gradually approach each other. In deference to American writers I leave them for the present. Cf. Les Arachnides de France, vii., 19 (1879).

III. CHTHONIUS, C. Koch.

1. C. CÆCUS, Packard. Amer. Nat., xviii., 203 (1884).

Hab. Virginia.

2. C. PACKARDII, Hagen.

3. C. PENNSYLVANICUS, Hagen. Record of Amer. Entom., 1868, 52; Proc. Boston Soc., N. H., xiii., 268 (1870).

Hab. Pennsylvania.

IV. OBISIUM, Leach.*

1. O. BRUNNEUM, Hagen. Record of Amer. Entom., 1868, 52; Proc. Boston Soc., N. H., xiii., 269 (1870).

Hab. "North America."

2. O. CAVICOLA, Packard. Amer. Nat., xviii., 202 (1884).

Hab. Virginia.

3. O. THEVENETI, Simon. Ann. de la Soc. Entom. de France, series v., viii., 156 (1878).

Hab. California.

4. O. MACILENTUM Simon. Ann. de la Soc. Entom. de France, series v., viii., 157 (1878).

Hab. California.

FAMILY GONYLEPTIDÆ.

I. PHRIXIS.

1. P. LONGIPES, Cope. Third and Fourth Geol. Rep. Indiana, 180 (1872).

Hab. Indiana.

FAMILY PHALANGIDÆ.

I. PHALANGODES, Tellkampf.

1. P. ARMATA, Tellkampf. Archiv für Naturge schichte, 1844, 320, Pl. viii., fig. 7-12.

Acanthocheir armata, Lucas. Annales de la Societè Entom. de France, viii., 977 (1860). *Wood*, Comm. Essex Inst., vi., 36 [Sep. 27] (1868).

Hab. Mammoth Cave, Kentucky.

* This genus has usually been credited to Illiger, but as Simon shows (Les Arachnides de France, vii., 51) it properly belongs to Leach.

2. P. FLAVESCENS, Simon. Les Arachnides de France, vii., 156, note (1879).

Erebomaster flavescens, Cope. Amer. Nat., vi., 420 (1872); Third and Fourth Geol. Rep. Indiana, 180 (1872).

Scotolemon flavescens, Packard. Bull. U. S. Geol. Survey (Hayden) iii., 165 (1877).

Hab. Wyandotte Cave, Indiana.

3. P. ROBUSTA, Simon. Les Arachnides de France, vii., 156, note (1879.)

Scotolemon robustum, Packard. Bull. U. S. Geol. Survey (Hayden) iii., 164 (1877).

Hab. Utah.

II. PHALANGIUM, L.

1. P. BICOLOR, Wood, Comm. Essex Inst. vi., 28 [19]. (1868).

Hab. Pennsylvania.

2. P. CALCAR, Wood. Comm. Essex Inst. vi., 26 [17]. (1868).

Hab. Virginia.

3. P. CINEREUM, Wood. Comm. Essex Inst. vi., 25 [16]. (1868).

Hab. New York.

4. P. DORSATUM, Say. Jour. Phila. Acad. ii., 66 (1821); Coll. Writings ii., 13; *Wood*, Comm. Essex Inst. vi., 18 [9]. (1868).

Hab. New York, Pennsylvania, Dist. of Columbia.

5. P. EXILIPES, Wood. Comm. Essex Inst. vi., 23 [14]. (1868).

Hab. Nevada, California.

6. P. FAVOSUM Wood. Comm. Essex Inst. vi., 28 [19]. (1868).

Hab. Nebraska.

7. P. FORMOSUM Wood. Comm. Essex Inst. vi., 30 [21]. (1868).

Hab. Pennsylvania, Dist. of Columbia.

8. P. GRANDE Say. Jour. Phila. Acad. ii., 67 (1821); Coll. Writings ii., 14; *Wood*. Comm. Essex Inst. vi., 34 [25]. (1868).

Hab. So. States.

9. P. MACULOSUM, Wood. Comm. Essex Inst. vi., 31 [22]. (1868).

Hab. Pennsylvania, Virginia.

10. P. NIGROPALPI, Wood. Comm. Essex Inst. vi., 22 [13]. (1868).

Hab. Pennsylvania.

11. P. NIGRUM, Say. Jour. Phila. Acad. ii., 66 (1821); Coll. Writings, ii., 14; *Wood*, Comm. Essex Inst. vi., 34 [25]. (1868).

Hab. North Carolina, South Carolina, Georgia, Texas, Nebraska.

12. P. PICTUM, Wood. Comm. Essex Inst. vi., 36 [21]. 1868.

Hab. Massachusetts.

13. P. VENTRICOSUM, Wood. Comm. Essex Inst. vi., 32 [23]. (1868).

Hab. Pennsylvania, Nebraska.

14. P. VERRUCOSUM Wood. Comm. Essex Inst. vi., 29 [20]. (1868).

Hab. United States.

15. P. VITTATUM, Say. Jour. Phila. Acad. ii., 65 (1821); Coll. Writings ii., 13; *Wood*, Comm. Essex Inst. vi., 20 [11]. (1868).

Hab. So. States, Texas, Nebraska.

III. CYNORTA.

1 C. ORNATA, Simon (?)

Gonyleptes ornatum, Say. Jour. Phila. Acad. ii., 68 (1821); Coll. Writings ii., 15; *Wood*, Comm. Essex Inst. vi., 37 [28]. (1868).

Hab. Georgia, Florida.

IV. NEMASTOMA, C. Koch.

1. N. TROGLODYTES, Packard. Bull. U. S. Geol. Survey (Hayden) iii., 160 (1877).

Hab. Utah.

2. N. INOPS, Packard. Amer. Nat. xviii., 203 (1884).

Hab. Kentucky.

V. OLIGOLOPHUS, C. Koch.*

1. O. BICEPS.

Mitopus biceps, Thorell. Bull. U. S. Geol. Survey (Hayden) iii., 525 (1877).

Hab. Colorado, Idaho.

VI. PHLEGMACERA, Packard.

1. P. CAVICOLEUS, Packard. Amer. Nat. xviii., 203 (1884).

Hab. Kentucky.

VII. TARACUS, Simon.

1. T. PACKARDI, Simon. Comptes rendus Societe Entom. de Belgique, 2nd series, No. 64 (1879).

Hab. Colorado.

* *Mitopus* Thorell is joined to *Oligolophus* C. Koch by Simon, Les Arachnides de France, vii., 239 (1879).

ON THE DISTRIBUTION OF THE GENERA OF CARABIDÆ ALONG A RIVER SYSTEM.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

The St. Joseph River runs nearly diagonally through the township of Constantine, from N. E. to S. W. A small affluent, called Fawn River, empties into it at the point where the town itself is located.

The characteristic vegetation along the banks of the main river above town is beech, maple, elm, iron-wood, walnut, butternut, papaw, magnolia (or a tree very nearly allied), spice-bush, prickly-ash, sumach, witch-hazel, wild grape, ash, oak and hickory, with many quite rare and beautiful wild flowers, such as are found in rich and favorable places. But that of the affluent region is almost entirely oak and hickory (mostly oak), with hazel, sumach, a few poplars, willows, and in some places cedars, but with few wild flowers of any account. The cedars are also found upon the main river, both above and below town. This difference in vegetation is probably due to a difference in the nature of the soil, the lower and richer soil of parts of the main river producing a richer and more varied flora than the higher and poorer parts adjoining the affluent.

Now I have noticed in collecting that the *Carabidæ* seem to be distributed in a somewhat systematic manner along the main river and its affluent, genera occurring on the former which are not found along the latter, and less frequently *vice versa*. On the main river I have taken *Omophron*, *Helluomorpha*, *Galerita*, *Brachylobus* (*Lithophilus* [Say]), *Dicaelus*, *Hestonotus* and *Amphasia*, which I have not taken on the affluent. *Galerita*, however, I have taken on the prairie to the south, but this partakes more of the nature of the main river region.

While on the affluent I have taken *Notiophilus*, *Calosoma* and *Pasimachus*, which I have not taken on the main river. The *Notiophilus* is a specimen which I have determined to be *sibiricus* Mots. It was taken on 19th October, 1884, while I was chopping over some sod with a hatchet on an elevated grassy bank, which formed an open spot in the woods at this place. As this is the only specimen of the genus I have up to this time met with here, it may be found yet upon the main river. Of *Calosoma*, I have often taken *calidum* (Fab.), and once *scrutator* (Fab.), up the affluent. The latter, a very rare insect here, three or four specimens only having been taken to my knowledge within the last

eleven years, I should have expected to find on the main river, as the rarer and more beautiful genera seem to be found there more frequently. However, one or two of the specimens were taken in town, and may belong to either region; and I think very likely that *calidum* (Fab.) is found up the river in the fields.

The genera I have observed upon both the main river and the affluent are *Scarites*, *Brachynus*, *Platynus*, *Pterostichus*, *Chlaenius* and *Harpalus*. I think I have also taken *Galerita* on the affluent, but such occurrence is rare. *Brachynus* and *Chlaenius* are much more abundant on the main stream, as indeed are nearly all of those given. I know of only two specimens of *Brachynus* being taken on the affluent, while in damp or wet places on the main river, which are much better suited to them, they are quite plentiful. Of the genera *Carabus* and *Cychrus*, I have never met with a representative here in any section.

This distribution is undoubtedly due to the richer flora of the main river producing more varied species upon which the *Carabidæ* prey, and also to that to which in turn the richer flora is due, namely, the richer soil and more favorable locality.

MONOGRAPH OF THE EMBIDINA.

(Continued from page 155.)

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

6. *Oligotoma Westwoodi*, n. sp.

O. Westwoodi Hag., Synops. Embid., p. 222 (no description, not named.)

Length of body 4½ mill.; exp. of wings 7 mill.

Male: As the specimen is enclosed in copal *(Gummi anime)*, the colours are not certain, but the head, with antennæ and palpi, the thorax and the legs in part, seem to have been blackish-fuscous; head more Raphidia-like than in any other species; more than half longer than broad; the rounded sides sloping down, the occiput less than half as broad as the front part with the eyes; head above slightly convex, epistom large, convex; eyes large, prominent, about orbicular, with a small ex-

cision for the insertion of the antennæ; facets large, globose; antennæ long, reaching the end of the metathorax, inserted in a longer socket, 15-jointed; 1st joint a little thicker, cylindrical, half as broad as long; 2nd as long as broad; all others obclavate, to three times longer than broad, but the 3rd to 5th a little shorter than the rest, the last one more ovoid, with tip rounded; there seems not to be wanting any joint more. Labrum large, rounded, a little darker in middle; max. palpi 5-jointed, the three basals alike, short, as broad as long; 4th a little longer, 5th longer, ovoid; labial palpi 3-jointed, apical joint longer, ovoid. Prothorax as broad as occiput, about quadrangular, broader near the mesothorax; a deep transversal sulcus a little before middle, where the sides are notched; legs as usual, femoral and basal joint of fore legs elongate-inflated; middle legs less strong.

Wings very little longer than the abdomen, narrow, ¾ mill. broad, four times longer than broad, rounded on tip, hairy around and on the membrane, which is rugose, smoky, with four white longitudinal bands, the fifth near the costa being almost obsolete. Subcosta dark, ending unconnected after the basal fourth of the wing; a little earlier in the hind wings. Radius a little before the tip of the wing connected below with one long vein, which runs parallel to the radius and ends on the tip. This vein represents the sector and its upper branch (McLachl.); the sector itself is wanting from the place where the upper branch originates (it is marked by a small break of the vein) to the tip. There is no other vein in the wing except the strong anal vein originating from the base of the sector shortly before a transversal between the sector and radius. I have for convenience always used McLachlan's names of the veins, though it is obvious by this species that what he calls upper branch is really the prolongation of the sector itself. I will try later to give a homology of all the veins of the wing. The hind wings have exactly the same very simple venation; the discoidal cell is open. The abdomen is not entirely visible from above, as a Hymenopterous insect, partly overlaying. The segments are equal, once broader than long, except the two last ones, which are considerably shorter; the apical margin of the last one is cut asymmetrically, the right half of it considerably shorter than the left side; appendages as long as the four last segments, stout, two-jointed; the apical joints cylindrical, rounded at tip, as long as the basal ones; the appendages are asymmetrical, the right one stout, straight, a little longer, the left one curvated, a little thinner. No side-view is possible. Between

the appendages is projected a broad inflation, narrower on tip, and just on its middle a spine coming from the right, as long as the basal joint, cylindrical, sharp on tip, somewhat curvated to the right ; a much smaller and shorter spine on the left side does not exceed the inflation. Abdomen from below with penultimate segment as long as the others, very dark, blackish ; last segment pyramidal, rounded on tip, the left side asymmetrical, stronger notched.

In the same lot of copal I received another specimen of exactly the same size, but differing as follows : The whole insect has copal colours, less dark, only the head is dark brown. Both antennæ are only 14-jointed ; the apical joint is ovoid, without any traces on tip of a broken-off segment. Wings pale, but with obvious traces of a smoky color and white longitudinal bands ; the discoidal cell is closed in all four wings by one strong transversal vein, and two in the left anterior wing ; all wings show 4 to 5 small costal transversals in the apical half, but these may also exist in the other specimen, the costal margin of which is not plainly visible.

The venation is alike, but all veins not developed are indicated by a series of small, darker hairs inserted in a more visible and deeper hole. I have formerly pointed out that just the same occurs in the wing cases of the Calopteryx nymphs. The appendages are to be seen well from below ; they are alike ; the right spine is longer, less thick, bifid on tip ; near by is a short, cylindrical, curvated tube, with open end ; the left spine is triangular at base, the apex twisted and sharply pointed.

One joint more or less of the antennæ, one transversal more or less in the wing, can of course not be a specific difference. The marked character of the right spine between the appendages would be of importance, if it would be possible to examine the same organ in the other specimen. This is not the case, and therefore the existence of a similar character is at least not impossible.

Hab.—I received both specimens forty years ago among other copal insects bought from the large Drogues House Gehe in Dresden, Germany. It was sold as East Indian copal. Later I discovered that all copal sold at that time as East Indian copal came from Salem, Mass. It is indeed probably Zanzibar copal ; this trade was then entirely in the hands of Salem merchants ; the copal was brought to Salem by the extensive East Indian trade of this city, and sold to Europe.

I request the honor of dedicating this gentle species, the smallest

known, to the first monographer of Embia, the Veteran Entomologist—Indefatigatus, Doctissimus !

The rudimentary venation separates this species from all known, by the want of the lower branch of the sector.

Prof. Westwood in his monograph, l. c., p. 374, mentions two apparently distinct species in gum copal, probably from the eastern coast of Africa, in the collection of Dr. Strong, of Brook Green—"one which from its size may probably be the *Embia Savignyi;* seemed to possess 14-jointed antennæ." The size of *E. Savignyi* is so much larger that this copal species can not be *O. Westwoodi.*

The other species was of still larger size, with slightly stained wings and 24 joints in the antennæ. Both are unknown to me.

The published copal insects contain no Embia. A careful examination of the large collection of copal insects here did not give any more Embia.

7. *Oligotoma nigra,* n. sp.

Embia nigra Hagen, Synop. Psoc. et Embid., l. c., p. 221–222 (no description).

Male, dry : Length of body 8 mill.; exp. of wings 13–15 mill. Head dark fuscous, a little shining, sparingly covered with small pale hairs ; head a little longer than broad ; the part behind the eyes narrower, rounded, nearly orbicular ; above slightly convex ; eyes large, black ; epistom quadrangular ; labrum large, fuscous in middle, rounded ; antennæ longer than head and prothorax, 13 joints present, fuscous, very hairy, hairs long, brown ; 1st joint cylindrical, a little thicker than the others, once longer than broad ; 2nd cylindrical, short, as long as broad ; 3rd as long as 1st, larger on tip ; 4th to 6th short, very little longer than broad, thicker on tip, 5th and 6th longer and thicker than 4th ; 7th to 9th about alike, similar to the preceding ones, but longer ; 10th to 13th longer, about four times longer than broad, more cylindrical ; rest wanting. Another specimen has also 13 joints, but here the 10th to 13th are not so elongated ; perhaps the difference is caused by the preparation. Mandibles strong, brown, with three black sharp teeth on tip ; the right mandible has the inner teeth shorter ; max. palpi 5-jointed, the two apical ones longer, the last one ovoid ; lab. palpi 3-jointed, fuscous, the apical longer, ovoid ; labium pale, rounded, bifid ; head below brown, mentum blackish. Prothorax brown, much narrower and shorter than the head, a little longer than broad, and dilated to the wings ; sides oblique ; a transversal sulcus

after the apical third; the sulcus prolonged near the sides towards the base, inclosing an elevated part (les trois festons de Rambur).

Wings smoky fuscous, the median and the anal veins darker, blackish; five longitudinal white bands; four to five fine costals in the apical part; two (in one hind wing, four) transversals in the cell. Legs brown, articulations paler; dilated in the usual way, so far as it can be observed, the 1st joint of tarsi not very much dilated. Abdomen brown, last segment nearly cleft by a deep sulcus, nearer to the right; appendages long, very hairy; basal joint longer than the last segment, apical joint longer and thinner; right spine long, slowly thicker towards the base; tip sharp, bent up a little; this spine is turned strongly to the left, as long as the intromittant, cylindrical tube; the left spine is half as short, the sharp apical end returned. I can not ascertain if there is any asymmetry of the appendages.

The description is made from three males, showing the smaller dimensions, collected in Upper Egypt; the fourth, a little larger and much darker, collected near Cairo, is alike; the end of the abdomen is not visible.

Female ? dry. Length of body 10 mill.

The two females before me differ from the males by similar characters as *O. Michaeli*. The body is black, a little hairy, somewhat shining, except the head, which is finely aciculate above. Head more rounded, the eyes small, not prominent; antennæ (only 13 joints present) short; 1st joint thicker, cylindrical; 2nd very short, annular; 3rd longer, larger at tip; all the following alike, short, nearly globular; the 2nd to 4th joint a little paler than the others, which are blackish. Prothorax a little broader than in the male; mesothorax longer, narrower towards the prothorax, without any traces of wings; metathorax similar; legs black, articulations paler; the enlarged parts, principally the basal joint of the tarsus of fore legs, stronger developed and more enlarged. An external spine on the basal joint is perhaps present. Abdomen longer, black; last segment rounded on tip; the appendages thick, very short, the apical joint a little longer; the abdomen of these carded specimens can not well be examined, but I believe that I am seeing a female genital opening. I can not find any asymmetry.

Hab. The larger winged male and the two females, called larvæ by Prof. Schaum, were collected by him on the island of Rhoda, near Cairo, Egypt, end of January, 1851, by beating the grass with the net in the

evening. The winged one was very agile in flying. Of the wingless ones he never took more than two at one beat, and they moved around like a slow Staphylin. They were very rare in February. The smaller ones were collected by him in February, 1852, in Middle and Upper Egypt. They are said to be very common in summer.

The winged *O. nigra* is entirely different from *E. mauritanica* Lucas. In 1857 I had the opportunity of seeing the only copy of the splendid and very expensive Explor. de l'Algerie then existing in Germany, belonging to the R. Library in Berlin. Even then, the copy being at the binder's, I had only a hurried glimpse, together with the late Prof. Schaum, who believed his species to be identical with the species of Mr. Lucas. This explains the question mark after *E. nigra* in my Synopsis. Now I have this expensive work in my room! I remark this fact only to explain the difficulties with which entomologists had to contend thirty years ago. That the winged specimens are different from *E. Savignyi* is directly obvious. I can not decide if the wingless form belongs to the winged one. Prof. Schaum considered it to be the larva, but as it is of the same size with the winged, this is scarcely probable, except (being females) by assuming that the female imago is much larger. The symmetrical appendages are very different from those of the males, and it could be presumed that the wingless form belongs to *E. Savignyi;* but this species seems to be different. Therefore we have to wait for new observations. As I received first the black wingless form, I applied to it the name *E. nigra*, which I would not change as the name had been quoted by several authors.

A wingless specimen collected by the late Prof. Loew in Asia Minor, probably near Kellemisch, is similar, but less dark. The pinned specimen, 8 mill. long (last segment wanting), may belong to *O. nigra*. Head and prothorax similar, antennæ short, with 17 joints. The color of the abdomen below yellowish brown. The condition of the specimen is too indifferent to say more than to note the occurrence of a species similar to *O. nigra* in Asia Minor.

8. *Oligotoma antiqua.*

Embia antiqua Pictet and Hagen. Berendt Bernstein Ins. ii., p. 56, pl. 5, f. 7.

Male? wingless. Length of the body 10 millim.

Body dark, sparingly villous; head oblong, a little narrower behind and rounded; above light convex, smooth, depressed behind the eyes,

which are small, not prominent; antennæ as long as head and prothorax, 18-jointed; 1st cylindrical, thicker; 2nd very short; 3rd as long as 1st, the rest shorter, thicker on tip, the last one ovoid; max. palpi 5-jointed, the last one fusiform, longer; labial palpi 3-jointed, the last longest; labrum rounded; epistom short, broad; prothorax narrower and shorter than the head, quadrangular, sides straight, front angles sharp, hind angles rounded, a transversal sulcus in the frontal third; mesothorax quadrangular, longer than prothorax, near the front margin on each side an oblique impression, and behind a small horizontal one; metathorax similar, but shorter; no traces of wings. Abdomen with 9 oblong dorsal segments, the 8th shorter, apical margin notched; 9th large, conical, with a strong longitudinal impression, nearer to the right; below 8 segments, the last large, ovoid; appendages strong, very villous; apical joint thinner, cylindrical; the basal a little curvated; legs strong, villous, femora of fore and hind legs and basal joint of tarsi of fore legs largely inflated.

Hab. Four specimens in Prussian amber; I have little doubt that it belongs to Oligotoma; the apparent asymmetry of the last dorsal segment makes me believe that the appendages are also asymmetrical, as I had seen them so when studying the specimens; but these parts were not well visible. I have amended the description after manuscript notes, namely, the antennæ, which are there given with 19 joints, because the socket is counted as 1st joint. Since then more specimens have been found, but no winged ones.

9. *Embia Savignyi.*

Savigny Descript. d'Egypte Néuropt. pl. 2, f. 9-10 (no name).

Embia Audouin Expl. sommaire du planches, p. 194.

E. Savignyi Westwood, Trans. Linn. Soc., vol. xvii., p. 372, pl. ii., f. 1.

E. Savignyi Burm., Handb. vol. ii., p. 770, 1.

E. Savignyi Ramb., Neur. p. 311, 1.

E. Aegyptiaca Blanch., Hist. Ins. p. 48. (Not seen by me.)

E. Savignyi Brauer., Neur. Europas, 1876, p. 32.

Length of the body 9 mill.; with wings, 12 mil.; exp. of wings nearly 20. The measures are only approximative, the condition of the specimen not allowing more.

Male. Body leather-yellow, somewhat shining, villous; head about quadrangular, rounded behind, rather flattened above, a little depressed transversely behind the eyes; antennæ broken (Burmeister quotes 17 joints, Savigny figures only 15); eyes large, black, notched before; max.

palpi 5-jointed, brownish. Prothorax much narrower than the head, enlarged towards the wings ; a little longer than broad, sides straight ; in the anterior third a transversal sulcus ; behind convex, divided by an impressed middle line. Mesothorax with a transversal elevation divided in the middle between the base of the wings. Legs a little darker with the usual dilatation of femur and the basal joint of tarsi of fore legs. Wings longer than the abdomen, a little broader than those of Oligotoma, light brownish-smoky, with five longitudinal white bands ; the inferior branch of the sector is again furcated (and occasionally a third time, as in one wing of Savigny's figure and in the specimen before me). Four to five partly incomplete costal transversals, two in the closed cells, and several more in the two or three spaces between the sector-branches. Abdomen enlarged behind, last ventral segment larger, convex, shining, brown. Appendages broken ; two-jointed, long, thick, after Savigny and Rambur. I presume the specimen to be a male, because no female genital opening is visible.

There exists no description of Savigny's type except Rambur's of the incomplete specimen in the Jardin de Plants in Paris, which has probably been figured by Savigny. Burmeister has described some specimens in the Museum in Berlin, Prussia, and my specimen is one of them.

Hab. Egypt, Savigny and Ehrenberg in Berlin Museum.

The figures by Savigny are excellent, as usual ; it is to be remarked that he has seen and figured f. 9, u. e., the opening of the spinning glands inside of the labium.

Rambur, l. c., p. 312, carefully describes a larva which belongs very probably to this species. The patria of the larva, which is now in De Selys-Longchamps collection, is unknown. Perhaps it may be a female.

A wingless specimen collected by Prof. Schaum near Athens, Greece, November, 1851, now in my collection, agrees very well with Rambur's description ; 10 mill. long, brownish-ferruginous, villous ; the end of the abdomen of the carded specimen is not well visible. The head is a little more oval and not so distinctly quadrangular as in *E. Savignyi*. Antennæ short, 17 joints. The body is narrower than in *E. Savignyi*. Otherwise it has the characters described before as belonging to the female, namely, the small, non-prominent eyes, and the external spine of the basal joint of tarsi of fore legs. Of course it can not be decided if this specimen belongs to *E. Savignyi* or not. Prof. Schaum had also collected a winged specimen at the same place, which was unfortunately lost. Prof. Brauer, l. c., quotes this species from Southern Russia with ? (authority not stated).

NOTE ON HABIT OF LARVA OF P. ATALANTA.

BY W. H. EDWARDS, COALBURGH, W. VA.

In C. ENT., 14, p. 223, I stated that Newman, in Nat. Hist. Br. But., described the mature larva as pupating in a case specially prepared for the purpose on the plant it had been feeding on: "from the roof of this the caterpillar suspends itself and becomes a chrysalls." Also quoted from Harris, who says the larva "seeks a suitable place in which to undergo its transformations." In the conclusion of the paper, vol. 15, p. 19, I said that I had never found a case with pupa in it, though I had often taken cases with the larvae in earlier stages, and I ventured the conjecture that both Harris and Newman were right, but that in our climate the larva pupated differently from its habit in England.

On 24th July last, I received from Mr. Philip Laurent, of Philadelphia, about a dozen cases of *Atalanta*, each made of a single nettle leaf and containing a pupa suspended from the top. Mr. Laurent wrote that in 1882 this butterfly was very common, and that in a short time, on one occasion, he found 125 pupae in leaf cases; and that as far as observed, the larva selects a large leaf for its last case, in which it transforms; that as a rule it makes its last meal out of the outer end of the case, eating about an inch thereof; that he has however taken many that were not eaten at all; has also seen several in which pieces were eaten out of the side of the leaf.

I am glad to have this positive evidence; my opinion was based on the fact of never having found such a case, together with the testimony of Dr. Harris, as I understood it. But it is probable that I was wholly mistaken, and that the American habit of the species is like that in England. *Atalanta* was abundant here in 1881, but I have seen few individuals since. Just so *P. Cardui* was the most common butterfly here all through the season of 1884, and this year I have not seen one.

CORRESPONDENCE.

Dear Sir: While out for an ornithological ramble here on Cote des Neiges Mountain this afternoon, I observed a large number of *Danais archippus* congregated together; numbers were clustered on dead branches of trees and underbrush, also on ferns. I could easily have caught a

hundred without moving more than ten paces. I don't remember having seen this species so abundant here for several years. Last year *Pyrameis cardui* appeared to me to be the most plentiful butterfly here, during August and September. I also noticed a large number of this latter species on the marshes of Lake St. Peter, about sixty miles down from Montreal. This was in the early part of September, last year. If you consider the above notes interesting enough to publish, I should like to know the cause of the above mentioned assemblage of *archippus*. The weather was showery in the morning, and sunshiny in the afternoon, with a stiff breeze blowing from the south.

Montreal, 22nd Aug., 1885. ERNEST D. WINTLE.

CRYPTOBIUM FLAVICORNE, LEC.

Dear Sir: In his recent very interesting "A Study of the Species of *Cryptobium* of North America," Trans. Am. Ent. Soc., 1885, Dr. Horn has united with *pallipes* the forms hitherto known as *latebricola* and *flavicorne*. Having lately shown him a series of specimens in which the males have a denticle on the middle of the hind margin of the sixth (fifth visible) ventral segment, he writes that in none of the males of *pallipes* in his cabinet does this little tooth exist, and that he thinks it could not have existed in any specimens of the series which he examined while preparing his paper. He thinks, however, that the species thus indicated is the *flavicorne* Lec., and says the females are only distinguishable by the very pale rufo-testaceous antennæ of *flavicorne* and the more or less piceous antennæ of *pallipes*. Immature females of the latter in Dr. Horn's cabinet and in my own appear indistinguishable from *flavicorne*. FREDERICK BLANCHARD.

Dear Sir: Whilst being out on a drive through the country last summer, I noticed a small yellow butterfly near the road side, too small to be a *Colias philodice* Godt. I jumped off the wagon and captured it, after a brief chase. To my astonishment, it proved to be a fresh specimen of *Terias lisa* Boisd., the first one ever taken in this locality.

I think it will be well to remember the following: To prevent moulding of the sand used for relaxing specimens, put a few drops of carbolic acid in the water to moisten the sand with; it also prevents the moulding of specimens should they be closed up too long.

PH. FISCHER, Buffalo, N. Y.

The Canadian Entomologist.

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HISTORY OF THE PREPARATORY STAGES OF VANESSA MILBERTI, Godart.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Conical, the base flattened, the top rounded; ribbed vertically, the ribs being either 8 or 9 in number; these rise from the surface at about one third distance from base, increase in elevation gradually, and end at the summit about the little flattened space which contains the micropyle, with its rosette of minute reticulations; the ribs meet the summit at an angle of about 45°; in the last part of their course they are thin, and are grooved on both sides to the surface; between them are many fine horizontal striæ; color green. Duration of this stage probably 4 or 5 days.

YOUNG LARVA.—Length $\frac{5}{100}$ inch; color yellow-green; cylindrical, nearly even from 2 to 10, the segments well rounded; marked by rows of fine black tubercles, each of which gives out a black hair in length about equal to the diameter of body and nearly all straight; these tubercles are flat, like circular disks, and the hairs are barbed (as seen under a high power); 2 has a sub-oval chitinous black dorsal patch with two rows of tubercles, six in front row, and two behind, these last standing between the second and third from each end of front row; the hairs longer than elsewhere and bent over head; on 3 and 4 each is a straight cross row over dorsum of eight tubercles, four on either side mid-dorsal line, and the third tubercle from top has two hairs; after 3 and to 13 are six tubercles each, disposed differently, four being on the front part of the segment, but not in straight line, the lower one of either side being a little behind the upper one, and the third tubercle lying between the two others, on the last part of the segment; these form three longitudinal rows from 3 to 13; on extreme end of 13 is an oval chitinous patch with several tubercles, the hairs straight and horizontal; below the spiracles from 4 to 12 are two short hairs each, from minute tubercles, the posterior one

raised a little above the other; on 13 but one; on 2 are three lateral tubercles, each of which gives two hairs, and placed, one above, one in front of, and one below, the spiracle; on 3 and 4, in line with the lower tubercle of 2 and the lower of the pair on the segments after 4, is a single tubercle and hair; over the prolegs are two short hairs each, and in same line, on 5, 6, 11, 12, is one hair; head rounded, a little depressed at suture, color black, shining; surface much covered with fine tubercles and bent black hairs. (The tubercles and hairs of this species are similar, and similarly placed, to those of *V. Antiopa).* Duration of this stage about two days.

After First Moult.—Length at 12 hours, $\frac{14}{100}$ inch; the middle of dorsum green cut by a brown line; the junctions of segments also green; the rest of upper half black-brown, below this and the under side yellow-green (some examples are darker than others, more brown, less green); above the spiracles is a yellowish wavy line from 5 to 10 inclusive, and with the spiracles a brown line; there are several rows of spines, one dorsal and three on either side; these are disposed as described in last stage, are low, rounded, with a small cone on summit; from the apex a single long black hair, and five or six short hairs around the basal part; on the cross-ridges of each segment after 2 are many fine points, each with a short hair; 2 has a blackish dorsal patch, with many hairs, bent forward; feet brown; pro-legs green; head cordate, shining, black, thickly covered with fine low conical tubercles, varying in size, each with its hair. Duration of this stage about two days.

After Second Moult.—Length at 6 hours, $\frac{24}{100}$ inch; color black over dorsum to middle of side; a mid-dorsal black line, with a pale gray-green line or stripe on either side of it; on the cross-ridges many white points, each with long whitish hair; in some examples the lower part of the black area is mottled with green-yellow; in one was a greenish patch on mid-dorsum on front of each segment after 2; the lower half of side green-yellow; on this area, with the spiracles runs a blackish line overlaid by a yellow line; under side yellow-green; the spines now long, slender, tapering to a point, with a bristle at top and eight or ten about the sides; color of the five upper rows black, of the lower laterals yellow; head as at second stage, the tubercles more numerous, and more prominent, the one on each vertex a little largest, some white, some black, the hairs all black Duration of this stage less than two days.

After Third Moult.—Length 12 hours after the moult, $\frac{1}{10}$ to $\frac{11}{100}$ inch; scarcely different as to color and spines from previous stage; black, the lower part and under side olive-green; the white hairs over surface give a hoary appearance to all the black area; the tubercles on head still more numerous, varying in size, more decidedly cone-shaped, the one on vertex largest. Duration of this stage less than two days.

After Fourth Moult.—At 12 hours, $\frac{1}{10}$ inch. Two days later full grown.

MATURE LARVA.—Length $\frac{1}{10}$ inch; slender, of nearly even thickness from 2 to 11; the upper surface black, thickly dotted with fine yellow-white points or tuberculations, larger and smaller (some of the smaller white), the former placed on the cross-ridges of the segments, the others irregularly scattered on and between the ridges; each of these gives out a white hair; under side yellow-green; a black stripe passes between the pro-legs; 2, 3, 4 are black, and 5, 6, 11 to 13 have much black; in line with lower lateral spines a bright yellow line or stripe in long crenations, one of which extends the breadth of the segment, and another similar line is above spiracles, the two curves meeting at the spines; under these is a russet space making a pretty wide band, not evenly colored, and varying in individuals; a fulvous patch, always small, often a mere dot, above and back of each spiracle; occasionally the upper yellow line is reduced to a patch on each segment, and sometimes this is enlarged and conspicuous; spiracles sub-oval, yellow rings with black centres; feet black, pro-legs green; on 2 is a dorsal collar bearing several small white spinose processes, and many white hairs, which are bent forward; the spines are in seven rows, one dorsal, three on either side, being upper, middle and lower lateral; the dorsals run from 5 to 12, the first laterals from 3 to 12, the middle from 3 to 13, the lower from 5 to 12; the lower laterals are greenish-yellow, with bristles of same color, the 5 upper rows are black, from blue-black bases; all these spines are slender, tapering to point, with a white bristle at tip, and a few short black ones about the sides; along base are bunches of small green irregular tubercles, with hairs; head sub-cordate, black, shining, with many conical tubercles, large and small, mostly white but some black, the one on vertex a little larger than others, each with its hair; these hairs are black on upper part of face, white on lower. The black changes to dark brown as the larva progresses, and the russet band loses its distinctive color, becoming olive-green. Duration of this stage about four days.

CHRYSALIS.—Length from $\frac{6.5}{100}$ to $\frac{7.4}{100}$ inch; breadth across mesonotum $\frac{2}{10}$ to $\frac{2.3}{100}$ inch; across abdomen $\frac{1.5}{100}$ to $\frac{2}{10}$; head case much produced, the sides either excavated from extreme ends of the processes, or not at all. but tapering to end; these processes conical, rather short, the space between a little excavated; mesonotum prominent, rounded, slightly carinated, with a very small three-sided pyramidal process at summit; the excavation below mesonotum angular, the wing case considerably elevated, the process at base sharp, triangular; abdomen conical, marked on dorsal side by three rows of tubercles, corresponding to the three uppermost rows of spines in the larva; the mid-dorsals low, rounded, the others prominent on middle segments, those on mesonotum small, but all the sub-dorsals are sharp and conical; color variable; many examples are soiled white, with slight brown stripes on abdomen, one dorsal, one ventral, one on either side, the ventral extending from head case to posterior end; the whole surface specked and finely streaked with brown; and the whole, except the last 4 or 5 segments, bronzed more or less strongly; some examples have the wing cases unicolored, others clouded in two shades; other examples are wholly light brown, and largely bronzed; others are dark brown, the whole dorsal area lighter, and mottled and streaked with yellow-white; in these last is often no bronzing except of a few tubercles below mesonotum; others are blackish throughout, the bronzing confined to the tubercles last spoken of. Duration of this stage in July 5½ days. Following one individual:

Egg hatched,	July	3rd.
1st moult	"	5th–6th, in night.
2nd "	"	8th, 10 a. m.
3rd "	"	9th–10th, in night.
4th "	"	11th, 4 p. m.
Suspended	"	15th, 6 a. m.
Pupated	"	15th, 6 p. m.
Imago out	"	21st, about noon.

From hatching to pupation, 12 days; to imago, 17½ days. The last imago came out on 24th July.

Milberti does not live at Coalburgh, or so far as I know, to the south of this; but is a common species in certain localities throughout the Northern States from New England and New York west; also in Colorado and Rocky Mts. northward, and in the Pacific States, and even British

America. I used to take a few specimens in August in the Catskill Mts., but the species was rare there. I have had many eggs sent me from Truckee, Cal., and from Rochester, N. Y., the latter by Mr. H. Roy Gilbert. The larvæ sent me by Mr. Gilbert in former years refused our native broad-leaved nettle, and starved to death on it, so that I was obliged to import several roots of the food plant, *U. dioica*, from Rochester, and grow it in my garden. I desired to see whether or no this species in larva behaved like other of our Vanessans. Although so common, very little has been published of *Milberti* at any stage, or of its larval habits. Say, under the name *Furcillata*, figures the butterfly, 1825, and says it was several times observed in the North-west territory during the progress of the Long Expedition, but says nothing of the larva. Boisduval & Le-Conte, 1833, also figure the imago, and say of the larvæ merely that they live in cluster on a species of Urtica in the neighborhood of Philadelphia. Kirby, 1837, repeats Say, adding Canada as a locality. Harris, 1862, briefly describes the caterpillar and chrysalis ; says the butterflies are rare about Boston, but common in north-west Mass. and N. Hampshire, and appear in May and again in July and August. Prof. Lintner, Proc. E. Soc. Phil., 3, 61, 1864, describes the mature larva, in part at least from an alcoholic specimen, and the chrysalis ; and says there are two annual broods of the butterfly (at Schoharie, N. Y.), in April and August ; that the larvæ are usually very abundant on *Urtica dioica*, but that nearly all are destroyed by a parasite. Mr. Wm. Saunders, C. Ent., 1, p. 76, 1869, describes the adult larva, and says that the first brood of the butterfly appears (London, Can.) toward end of June, and again in August, but says nothing of larval habits. Mr. Scudder, in Syst. Rev., 1872, says of *Milberti*, that the eggs are laid in clusters on some of the terminal leaves of the nettle, that the caterpillars feed in close company during the earlier stages, but subsequently scatter. Mr. Henry Edwards, Proc. Cal. Ac. N. Sci., 1873, briefly describes the mature larva and chrysalis. Mr. T. L. Mead, in Report on Wheeler Expedition, 1875, says that *Milberti* larvæ were common about Denver early in June on nettles, and that almost every plant had many on it, in various stages of growth, while the females were still depositing their egg clusters. Mr. Scudder, in "Butterflies," 1881, p. 138, figures the butterfly, says there are two broods (in N. E.) in June and September ; and on p. 99, gives figure of cluster of eggs on under side of nettle leaf ; says the eggs are laid upon the under surface in large open patches, *in which they are rarely if ever piled upon one*

another, sometimes several patches upon the same leaf. On page 152, it is also stated that the species is *triple-brooded in Canada*. Finally, Prof. Fernald, But. Maine, 1884, briefly describes the mature larva, adding that the spines are arranged as in *V. Antiopa*, which, as I shall show, is in some degree erroneous. That is all I have been able to find of the history of this common butterfly, and that is very little

The egg of *Milberti*, in shape and ornamentation, is like that of *Antiopa*. The young larva is like the young of that species also in every particular, so far as I can discover. Every hair in the one has its counterpart in the other. Of the second stage of *Antiopa* I cannot now speak, but of the third and subsequent stages, comparing them with *Milberti*, there is a difference in regard to the dorsal row of spines. In *Antiopa* these begin at segment 7 (head being No. 1) and end on 12, whereas in *Milberti*, as in Vanessa *Urtica* and *Polychloros*, also in all our species of Grapta observed, the dorsal spines begin at 5 and run to 12. (A table of the spines of Vanessa and allied genera may be found in Weismann's Studies, English Ed., p. 448, with interesting remarks on the relationship of all these species).

I received 7th May, 1885, from C. F. McGlashan, Esq., Truckee, Cal., a great cluster of eggs, on nettle leaf, mailed 30th April. There seemed to be about 200 eggs, but they were piled so that it was not possible to count them. The bottom layer was right side up, and the eggs square on their bases, so far as could be seen; at each layer above there was wider departure from this, till at the top the eggs were more or less on their sides. In the thickest part the cluster was five layers deep. These eggs failed to hatch. On 2nd July, the same year, I received three similar clusters of eggs from Mr. H. Roy Gilbert, of Rochester, N. Y., piled up in same way. I had a large plant of *Urtica dioica* in flower pot, the branches nearly two feet long, standing at an open window in my room. On the upper side of a leaf of this I pinned one cluster. In about six hours thereafter the larvæ were hatching, and a few hours later had gathered at the base of the leaf, on upper side, and were nibbling at and through the leaf. There was no web or shelter. The next day the larvæ were on same leaf, and had eaten it almost wholly, leaving the frame. There was still no web. The same afternoon they left this leaf, and had got on the end of the next branch and were eating the terminal leaves, still without web or any shelter. They were in a dense mass, and when not feeding, their heads were all protruded, and at the least alarm, as the

shaking of the leaf, all the heads wagged together. This would be a natural protection against ichneumon flies, etc. I have observed the same simultaneous wagging in young larvæ of *M. Phaeton*, as an ichneumon fly was hovering over them. This habit my larvæ kept up through the second stage. The first moult was passed while they were all piled together. The habit in feeding during the second and third stages was as in the first, no web, no shelter, all in bunches. But after third moult part of the larvæ protected themselves in the manner of Grapta *Comma*, eating off the main ribs at the base of a leaf on under side, whereby the leaf drooped. The edges were drawn together pretty closely and nearly to tip, and several larvæ might be found therein. One small lot of larvæ were on upper side of a leaf at the base, and had drawn the edges together for a half inch from base, making an imperfect shelter, but the ribs were not cut and the leaf stood in natural position.

At fourth moult I had a fresh plant ready and the larvæ were transferred. They scattered about, bent and closed leaves as in previous stage, and in some of these were three and four individuals, in others but one. But sometimes the leaf was not bent, and was closed from end to end nearly, a single larva lying therein.

The weather was clear while I was feeding this brood, and at no time was there any spinning of a web, or spinning at all beyond what was necessary to close the leaves. From what I saw, I should say that the larvæ in the early stages were highly gregarious, that after third moult they were much less so, and after fourth (and last) had lost most of that habit. But had the weather been cloudy, or stormy, they might have acted differently, and protected themselves more or less by a web.

I asked Mr. Gilbert to observe what he could of *Milberti* in natural state. He wrote 15th July: "The eggs, so far as I have observed, are always eight or ten inches below the top of the nettle, and usually in cluster on under side; *but on one occasion I found them loosely scattered over the upper side*, covering nearly half the leaf. In rough, windy or showery weather, the young larvæ may spin a web on under side of the natal leaf. I have seen this twice, and it seemed to me only a temporary expedient to avoid the rain and to secure a safe foothold. But they generally go to the top of the plant and spin a web which covers the terminal leaves, and by additions come to extend for three to five inches down. My opinion is that if the weather be rough when the larvæ are hatched, they rest on the natal leaf; if fair, ascend. When very young there are

no stragglers, but towards maturity the larvæ scatter, the main body of the family keeping together till nearly grown. The 'nettles,' as we designate a certain spot, is a patch of that plant covering more than three quarters of an acre, lying on each side of a lane. I have seen perhaps forty families of these larvæ feeding there at one time, but never under the shade of trees which cover much of that ground. The larvae were always out in the sun. I have found the larvae will starve rather than eat the broad-leafed nettle."

Again, 17th July: "I visited the nettles yesterday. Found but one group of larvae, they about ¾ inch long. A bright-colored bug (Hemipter) with a long beak was active in picking off the larvae. I found four in a bent and closed leaf with one larva of *G. Comma;* six in a similar leaf; two in a leaf that was closed but not bent, two unprotected on the under side of a leaf, and one in plain sight on upper side. Found also a bunch of eggs just hatched, and the larvae had crawled to under side of the leaf and lay like a flock of sheep, heads up."

Again, 20th: "Found one group of about 200 larvae, all on upper sides of two opposite leaves, and a few inches below a web at top of the plant. These larvae measured ⅛ inch" (at or about 3rd moult).

"Another group, measuring ¾ inch" (after 4th moult) "were hidden in closed leaves on different stalks. Part of these closed leaves had the ribs cut, and these were crowded; the closed but uncut leaves had from one to four tenants. I have often noticed and know that after the last moult, the larvae scatter and feed openly. Can see a family several rods away where they are numerous."

I separated several of my larvae at one stage or other of their growth and gave leaves of our common broad-leafed nettle. At first they refused the food, then nibbled a little, and finally eat some leaves. But none of these larvae reached pupation, nor even passed a moult. They dwindled away and died. The same thing happened with larvae sent me in 1884. Mr. Gilbert reports a similar experience, as before said.

Specimens of the butterfly from the western plains and to Pacific have not the bright coloration seen at the east. They have a faded look.

ELAPHIDION VILLOSUM, Fabr.

BY FREDERICK CLARKSON, NEW YORK CITY.

There is in the study of Entomology a fascination and delight that captivates the imagination, and renders the enthusiast liable to construct

theories based upon such slender foundations that they fail to reach the dignity of assured facts. This, I think, may be said of much that has been written concerning the habits of this beetle. The record which I have thought proper to make relates to veritable facts, but whether in the particular instance referred to they are to be regarded as extraordinary and not of common occurrence, may be a problem yet to be solved. I trust that in offering this paper I may not be thought presumptuous in differing with so distinguished Entomologists as Drs. Harris and Fitch, yet as my observations do not bear out the conclusions which they have reached, and apprehending that the best interests of the science are served by that record or enquiry which relates to the discovery of facts, I make no apology to these fathers in the science for transcribing in relation to this subject views somewhat dissimilar to theirs.

Dr. Harris says that if a burrow be split open in winter, it will be found to contain the larva, which in the spring assumes the pupa form, and in June or July is changed into a beetle. He is in accord with Dr. Fitch concerning the periods of transformation, and holds similar views with him as to the habit of pruning. Dr. Fitch, I think, unduly exalts the instincts of these beetles as illustrated in their larval habit of pruning the twigs and branches of the oak, contending, as he does, that the twig or branch is eaten away by the young larva for a small space, and left supported only by the bark that the autumn winds may fell it to the ground, and that the environment of its new condition is necessary to the transformation of the included larva. This is substantially what each writer has to say upon the subject, though Dr. Fitch's report is very lengthened and rather extravagant in imaginative conclusions.

These oak pruners were very abundant in Columbia County, this State, in the season of 1878. The September winds brought showers of twigs and branches to the ground. I examined many of them, and found each to contain the larva, nearly full grown, in tunnels measuring from ten to fifteen inches long. I gathered five goodly sized branches just after they had fallen for the purpose of illustrating the burrows in my cabinet of nest architecture. The branches remained on a table in a room having very nearly the condition, thermometrically, of the temperature without, until the early part of November, when I opened them for the purposes already stated. I was astonished to find that every burrow contained the beetle; the transformation, therefore, from the larva to the imago was completed in less than eight weeks—how much less I know not—and

without the surroundings as narrated by Drs. Harris and Fitch. I am therefore inclined to the opinion, born of these facts, that the transformation, barring strong winds, is as likely to occur in the tree as on the ground, and that the branch is eaten away by the young larva not for the extraordinary reasons as cited, but for the more probable one, to prevent the flow of sap, which, if not checked, may render the wood fibre unwholesome to the larva, or possibly affect injuriously the later condition of pupa and imago. It would appear, moreover, that the beetle is developed in the autumn, and remains within the burrow during the winter.

MONOGRAPH OF THE EMBIDINA.

(Continued from page 178.)

BY DR. H. A. HAGEN, CAMBRIDGE, MASS

10. *Embia Mauritanica.*

E. Mauritanica Lucas, Explor. Alger., vol. iii., p. 111-114; Neur. pl. 3, f. 2, a-n. Cuvier, Edit. Masson, Neur., pl. 106, f. 8 (copy of Lucas' figure).

E. Mauritanica Lucas, Ann. Ent. Soc. Fr., 1859, ser. iii., vol. vii., p. 440-444.

I have never seen this species, and give the substance of the very detailed description of Mr. Lucas.

Winged imago: Length of body 13½ mill.; exp. of wings 16 mill. Body rufo-fuscous, rufous-villous; head longer than broad, flat, smooth; depressed transversally behind the eyes; frontal part reddish; eyes reniform, black; antennæ 15-jointed, smooth and not villous (as in *E. Savignyi)*, a little paler than the head; the joints after the 6th successively longer; labrum and palpi dark rufous; max. palpi thinner than in *E. Savignyi*, the two apical joints longer; labial palpi also more slender and the apical joint longer; prothorax a little longer than in *E. Savignyi*, with a transversal sulcus in the apical third; mesothorax anteriorly between the wings on each side with a yellowish transversal tubercle; metathorax similar. Legs dark rufo-fuscous, with the usual dilatation of the femur and the basal joint of tarsi of fore legs. Wings as long as

abdomen, light reddish brown, smoky, with pale longitudinal bands; sector trifid, four transversals in the cell, and one in the space below (after the figure). Abdomen light rufous brown, smooth above and below, somewhat hairy besides; appendages two-jointed, hairy, the apical one thinner, longer; the apical ventral segment below is to the left strongly truncated and excavated; in consequence of this asymmetry the basal joint of the left appendage is very short, broad, flattened and somewhat abortive. Mr. Lucas found the same asymmetry in each of the dozen of specimens collected by him. To decide the sex of his specimens he cut open the abdomen of several of them, and found all to be females.

Wingless larva (after Lucas): Length of body 13 mill.; breadth 2 mill. Rufo-fuscous; head ovoid, smooth, sparingly villous, above somewhat depressed; eyes reniform, dark fuscous, not prominent; antennæ rufo-yellowish, with yellowish hairs, as long as head and prothorax (after the figure), 18-jointed, joints about alike, successively shorter, the last as long as the first, but thinner, rounded on tip; palpi yellowish. Prothorax very short, anteriorly with a transversal sulcus; mesothorax twice longer, anteriorly with a much deeper transversal sulcus; base narrower; metathorax very short; no traces of wings (after the figure). Legs (after fig.) yellowish, the basal joint of the tarsi of fore legs dark fuscous, with the usual dilatations. Abdomen with nine dorsal segments; appendages rufous, the basal joint a little longer; the figure of the end of abdomen shows the last dorsal segment triangular.

Habitat.—Around Alger, especially near Milah and Constantine, the winged specimens living gregariously in sandy places in June on the stems of a dry *Scilla maritima;* very agile; 12 specimens collected. The larva is not very rare around Alger during the winter, living in small silken tunnels under humid stones; the larva is carnivorous and very agile.* Mr. Lucas, in his paper, Ann. Soc. Entom. Fr. 1859, l. c., states that he collected, April, 1850, at Medeah and Bogar, province Alger, some larvæ which were placed in boxes, but by chance forgotten till 1858. He found

* McLachlan, Embid., p. 376, says rightly: Hagen, Stett. Zeit. 1849, p. 56, said that nothing had then been recorded as to the habits. He (McLachl.) has overlooked the fact that my paper was written and delivered in 1848, and commenced to be printed in the same year. The continuation of Embidæ was printed February, 1849, before Lucas' work was published. The report of Lucas by Schaum, in 1851, contains nothing about the habits of Embidæ, nor any other report, as far as I know, before Lucas' second paper in 1859.

the walls of the box clothed with a very fine white silk, the network consisting of very small meshes and representing circular tunnels, in which the dead larvæ were found. Mr. Lucas has observed in the field threads of silk arranged near the entrance of the tunnels, and believes them to serve as traps or to give notice of the presence of insects. He believes the Embia to be carnivorous. The larvæ live isolated.

Concerning the larva, Lucas, Expl. Alg., p. 114, states that obliged to leave for Constantine in March, he put several larvæ in separate boxes together with some insects as food. After his return in October, he found all dead; only one had transformed to a winged imago. This interesting observation is the only one known of the transformation of the wingless form into the imago state. But then the nympha skin with the empty wing cases must have been in the same box. Though the observation of an eminently distinguished observer can not be doubted, still it is impossible that the imago could have transformed out of the wingless form without having before passed through a nympha form with visible wing cases. Mr. Lucas' observations are extremely interesting, in so far as he has stated the existence of winged females. The description of the internal female organs makes his statements entirely sure.

E. Mauritanica is very near to *E. Savignyi*. It is apparently a misunderstanding when Mr. Lucas, Ann. Soc. Ent. Fr. Bull., p. 98, states that I have united the two species in the Synopsis Embid., p. 21-22. Both species are there enumerated as different, and nothing is said about their relations. As I have never seen *E. Mauritanica*, I can state, after a careful study of the description and the figures, that both species must be very nearly related. It is to be assumed that Mr. Lucas has seen Savigny's type, described by Rambur, in the Jardin des Plantes. If he had seen other specimens I believe he would have mentioned the fact. Therefore his statements represent probably the comparison of his species with the type of Savigny. After all *E. Mauritanica* seems to differ by much darker colors, the lack of villosity of the antennæ of the imago (those of the larva are hairy), by the length of the last joint of palpi, by the asymmetry of the left appendage, and by less transversals of the wings.

11. *Embia Persica.*

E. Persica McLachl., Jour. Linn. Soc. Lond., vol. xiii., p. 382.

Female? Length of body 9½ to 10½ mill.; exp. of wings 13½ to 15 mill.

Nigra subnitida; caput vix in medio piceo tinctum; pronotum brunneum; antennæ nigrae, basin versus pallido cinctae, 24-articulatae, articulis duobus ultimis flavidis; alae angustae, fuliginosae, albido 5-striatae; venis fuscis. (McLachl.)

Hab.—Shahrud, Northern Persia. Three specimens collected by Mr Christoph in McLachlan's collection.

I have never seen this species; the detailed description must be compared in the original. There is no asymmetry noted, which is probably the reason that the author has considered them to be all females, with an appended? The species seems to be different from all described ones, but related to the two foregoing species.

12. *Embia Solieri.*

E. Solieri Rambur, Neuropt. p. 313, No. 4.

Larva, dry: Length about 9 mill. (or a little less than *E. Savignyi* Ramb.) Body rufo-fuscous, villous; head about quadrangular, a little depressed; eyes small, black, not prominent; antennæ reddish-yellow, a little longer than the head, villous, 18-jointed; 1st joint cylindrical, thicker than the others; 2nd short, 3rd longer, the rest globular. Prothorax narrower than the head, somewhat enlarged behind, about as broad as long, with a deep, transversal sulcus after the first third; mesothorax oblong; metathorax quadrangular; no traces of wing cases. Abdomen robust, broad, dark rufous, villous, a little shining; segments alike, twice broader than long, the last dorsal triangular, obtuse, symmetrical. Appendages (rudiments only present) reddish-yellow, the basal joint thick, short. The opening of the female genitals on the ventral side seems to be present. Legs ferruginous, femora partly darker; the femora and the basal joint of tarsi of fore legs dilated as usual; the only dried specimen before me shows these parts shrunk, but they seem less broad than in *E. Savignyi;* the middle legs are more dilated and stronger than usual.

Hab.—The specimen before me is labelled Spain. Probably it is the same mentioned by me (Stettin Ent. L. 1886, vol. xxvii., p. 285). I have studied the type of *E. Solieri* Rbr. and some other larva from Spain in the collection of DeSelys Longchamps, but I can not find my notes. At least Rambur's description agrees with the specimen from Spain, nevertheless, if my memory is not at fault, the specimen from Marseille is larger. It is very remarkable, that in the more than forty years since Rambur's publication no winged imago has been found, though the

wingless form is widely spread in southern France and in Spain, and seems to be frequently met with.

In Petit. Nouvelles Entoml. Paris, 1877, vol. ii., p. 182 (not compared), Mr. Bolivar, commenting upon Mr. Girard's opinion, that only one species of Embia exists in Europe, and that probably an importation, notes that a species is abundant in the larval form near Madrid, and is no doubt indigenous. Mr. Girard, l. c., p. 125, replies, and thinks the discovery not opposed to his hypothesis. McLachlan, l. c., p. 193, states that there can be no doubt as to perhaps more than one species living in Europe (of Record for 1877).

Mr. Lucas, Ann. Soc. Ent. Fr., 1880, Ball, p. xcvii,, had found in February, 1850, near Toulon, not far from the Fort Lamalgue, larvæ of *E. Solieri* below the humid stones. The larvæ were rather agile, and live like those of *E. Mauritanica* in silk tunnels made in hollow places of the stones. During the whole larval time they have the power of producing white silk to make tubes or tunnels in which they probably undergo their transformation. Contrary to Rambur's opinion the larvæ, at least of *E. Mauritanica*, live isolated, and only the adults become gregarious.

Mr. M. Girard, ibid. 1881, Ball, p. cxxxvi., reported *E. Solieri* larvæ colleected by Mr. Xamben, near Port Vendres (Pyrenees Orientales), in March, below stones in silken tunnels, which are traps for insects. The species is very different from *E. Mauritanica* and *E. Savignyi*, and was also found by Mr. Lucas near Perpignan and Collioures. He adds that these localities harbor other southern forms, as *Paussus Favieri.*

Mr. Lucas, ibid, 1882, Ball, p. clxxxv., found near Amélie-les-Bains, end of December and January, 1882, below stones, a few *E. Solieri* larvæ, long 9 to 12 mill, with 16, 18 or 20 jointed antennæ. It is very rare that both antennæ of the same specimen have the same number of joints.

Mr. Lucas, ibid, 1883, Ball, p. xxvi., compare at some length *E.* Solieri, the imago of which is still unknown, with *E. antiqua* Piot., in the Prussian amber. He states that this species closely resembles in form *E. Solieri*, but differs by its longer antennæ, which nearly exceed the metathorax, though in *E. Solieri* they do not exceed the mesothorax.

McLachlan, Journ. Linn. Soc., vol. xiii., p. 376, states that he possesses *E. Solieri* from Hyères, collected by Mr. Pascoe under stones.

13. *Embia (Olyntha) Brasiliensis.*

Olyntha Brasiliensis Gray, in Griffith Anim. Kingd., vol. xv., p. 374, pl. 72, f. 2.

O. Brasiliensis Westw., Trans. Linn. Soc., vol. xvi., p. 373, pl. 2, f. 3.

O. Brasiliensis Walk., Neur. Br. Mus., p. 532, n. 1.

Winged form (male?) Length of body 16 mill.; exp. of wings 25 mill. (from Westwood's plate).

"Antennæ corporis fere longitudine, articulis 32; alae nervo 4 interno trifido. Piceo niger, prothorace supra femoribusque 4 antiois ochreis, antennarum articulis 10 ultimis albis, alis piceis, vittis albis inter nervos longitudinales, nervisque transversis tenuiter albo-marginatis." (Westwood.)

Hab.—Brazil, coll. British Museum, formerly in Mr. Children's coll. I have seen only the type, first described by G. Gray in Griffith and figured ibid. by Westwood; on the plate it is named *Embius? Brasiliensis.* I have omitted "palpi maxillares 4 articulati" in Westwood's description, as it has been corrected by Burmeister in 5 articulati for Olyntha, and this statement is verified by examination of the type by McLachlan, l. c., p. 378. The few words in Griffith contain nothing more, except that prothorax and femora are called fulvous instead of ochreous. Though there is no asymmetry stated for this species the figure by Westwood has the tubercle between the appendages drawn more to the right, and the figure in Griffith has a spine on the left side and the right appendage (by error) three jointed. In 1857, on my way to London, I had compared *O. Brasiliensis* in the museum at Berlin, and the type in the Museum at Halle, both from the same lot, and when I saw the type in London, I had the impression that the type of *O. Brasiliensis* was different from Burmeister's species, with yellow appendages. In the figure by Griffith they are black. On my return I compared again the specimen in Berlin, and found my first impression confirmed. As I had seen only single specimens, and was then very little acquainted with this family, I thought it more prudent in my Synopsis Embid, p. 222, to draw attention to the supposed difference. I should remark that Mr. Walker has copied Burmeister's description instead of Westwood's, though he had the type at his disposal.

14. *Embia (Olyntha) Batesi.*

Embia Batesi McLachl., Jour. Linn. Soc., vol. xiii., p. 380.

Olyntha Brasiliensis ? Burm. Handb. vol. ii., p. 770.

Winged form: Length of body 7 mill.; exp. of wings 14 mill. (41 mill. is a misprint, McLachl.)

"Nigra vel nigro-picea; prothorax flavo-ferrugineus; antennæ nigrae, 20-articulatae, articulis quinis ultimis flavidis, pallide pilosis; alae breves, latae, nigro-fuscae, albido 5-striatae."—McLachlan.

For the detailed description the original should be compared.

Hab.—Amazon's coll. by Mr. Bates, one specimen in McLachlan's coll. I have no specimen before me. The identity of Burmeister's species with *E. Batesi* is at least probable; if it belongs to a different species, it would be new. The differences to be noted out of Burmeister's description are as follows: *O. Brasiliensis* Burm. has 30-jointed antennæ, "apice albis"; *E. Batesi* only 20-jointed antennæ, the apical fourth five joints pale yellowish. Now, accepting that the antennæ of *E. Batesi* were incomplete, Burmeister's species, if identical, would not have the tip, but the apical half pale. Burmeister has, "femoribus 4-anticis ochraceis"; McLachlan, "coxæ yellowish." Finally Burmeister says, "cercis albis"; McLachlan, "the 2nd joint obscure yellowish with black hairs." *E. Batesi* is stated by McLachlan to be the broadest-winged species known to him.

15. *Embia (Olyntha) ruficapilla.*

Olyntha ruficapilla Burm. Handb. vol. ii., p. 770, No. 2.

O ruficapilla Walk. Neur. Brit. Mus., p. 532, No. 2.

Winged male? Length of body 7 mill.; length with wings, 11 mill.; exp. of wings 17 mill.

Dark fuscous, nearly black, shining, villous; head and prothorax red; head longer than broad, ovoid, slightly convex above; a transversal furrow between the eyes, which are black and very prominent, and a sharp longitudinal impression in the middle of head behind the eyes; epistom transversal, half as long as broad, rounded besides; labrum short, somewhat triangular; mandibles orange; max. palpi fuscous, thick, 5-jointed, the last joint oval, larger; labial palpi fuscous, the last joint longer, ovate; antennæ dark fuscous, densely covered with dark hairs; only 16 joints present, which are longer than head and thorax together; thin, after 6th joint somewhat thicker; 1st joint cylindrical, a little stouter, 2nd short; 3rd a little longer than 1st, 4th to 6th a little shorter than 3rd; all following more elongate, fusiform, the two last ones again a little shorter. Pro-

thorax narrower than the head, longer than broad, enlarged at the base, flat, a transversal sulcus after the apical third. Legs rather long, dark fuscous, shining; fore legs with the femur, tibia and basal joint of tarsi equally long, compressed, dilated, the tarsal joint thicker, with a longitudinal furrow; the two apical joints short, the last one longer than the preceding; middle legs not so dark, more brownish, very little dilated, the basal joint of tarsus short, scarcely longer than the two following together; the whole tarsus very little longer than the tibia; hind legs with very strong, long, dilated femur; tibiæ shorter, less dilated, compressed; tarsus about as long as tibia, basal joint not dilated, about as long as the two others together; the second very short; all claws bent, sharp, much thicker at base, rufous. Abdomen black, villous, shining, one third shorter than the wings; last dorsal segment polished; appendages black, villous, very long; basal joint thick, straight, apical joint longer, thinner, a little narrowed in the middle. The abdomen is too much shrivelled to make out anything more; I can not see any asymmetry, at least not of the appendages. Wings about four times longer than broad, smoky black, rugulose, with four narrow white longitudinal lines, the anterior (fifth) wanting; venation dark fuscous; sector trifurcate; about five costals and five transversals in the cell; in the spaces below some transversals.

Hab.—Brazil. I have before me two dry specimens; one from the collection of the late Dr. Schneider in Breslau, Prussia, has only the label Brazil; it may have belonged to the same lot with Burmeister's types and those in the Berlin Museum, but it has not been compared with them. The other was collected by the late Mr. Appun in Venezuela; head and prothorax wanting.

In my Synops. Embid. p. 221, I had put *E. Klugi* Ramb., Neur. p. 313, No. 3, with a question mark, to *O. ruficapilla*. In my Syn. of N. Amer. Neur., p. 301, it was given as a separate species. I have never seen the type, which was collected by Delalande in Brazil, and belongs to the Museum in the Jardin des Plantes in Paris. Rambur has apparently omitted to describe the wings. If they had not been present, he would have named the specimen a larva, as in the two other cases. Otherwise his description, which is very detailed for the legs, contains nothing that would not apply to *O. ruficapilla;* perhaps his specimen was somewhat darker.

The specimen from Brazil before me presents in all the wings an inter-

esting anomaly of the venation, though the specimen from Venezuela has in all wings the usual venation. The apical end of the cell is usually formed by the radius and the upper branch of the sector meeting shortly before the tip of the wing, forming a curve from which a short vein emanates. Now in the Brazil specimen the upper branch of the sector runs straight to the tip of the wing; the radius ends a little before and is not connected with the sector by curving down, but by a straight transversal, parallel to the other transversals. The cell is therefore not closed, as usual, at the end by a curve. The radius is connected with the margin by a costal originating at the same point with the last transversal in the cell below. The same arrangement of the venation occurs only in *O. Westwoodi*. That it occurs in *O. ruficapilla* as an aberration is rather important, and it will help to a right understanding of the venation.

16. *Embia (Olyntha) Salvini.*

Embia Salvini, McLachl. Journ. Linn. Soc., vol. xiii., p. 380.

Winged male. Length of body 7 mill., exp. of wings 12 mill. (both approximative). Body black, sub-opaque, covered sparingly with dark hairs. Head very little longer than broad, about quadrangular, the sides very little sloping to the rounded hind angles; a large shallow depression on the middle of the disk above, in the centre of which is a very faint short elevated longitudinal line; eyes black, large, but less prominent than in *O. ruficapilla*, reniform; antennæ with only 19 joints present, which are nevertheless longer than head and thorax together, yellowish to 8th joint, the following successively darker, fuscous nearly blackish, polished; all with long fuscous hairs; basal joint cylindrical, stout, a little darker than the following, reddish yellow; 2nd small, as long as broad; 3rd as long as the two basals together; 4th half as long as 5th, pyriform; 5th to 10th successively longer, pyriform; all following shorter, a little thickened after the middle; labrum short, half as long as broad, rounded, yellowish at base and sides; the middle and margin blackish; max. palpi dark fuscous, thick, 1st to 4th joint short, about alike, 5th longer, sub-acute; labial palpi similar, last joint longer; all palpi clothed with paler hairs; mandibles black on tip; mentum large. Prothorax short, half as broad as the head, enlarged to the wings, with a faint median longitudinal impressed line and a deep anterior transverse sulcus, prolongated shortly along the oblique side-margin; mesothorax rather longer than broad; metathorax nearly quadrangular. Legs shining black, clothed

with pale hairs, tarsi somewhat castaneous ; fore legs strong ; femur, tibia and first joint of tarsus of about the same size, compressed, dilated ; the two last joints of tarsus small, short ; middle legs about alike, but the 1st joint of tarsus shorter, much less inflated ; hind legs wanting. Abdomen black, shining ; appendages long, blackish, clothed with yellowish hairs ; right appendage with the basal joint stout, apical joint longer, thinner, both straight ; left appendage broken. I can not make out any asymmetry, but I can not examine the dorsum of the last segment ; between the appendages, nearer to the left, a spiniform yellow sharp process, bent to above. Wings narrow elongate, smoky blackish, with five longitudinal narrow whitish lines (the 4th becomes confluent with the 5th before its apex on the anterior wings in McLachlan's specimen) ; venation fuscous ; sector trifid ; cell long with two transversals, and several more in the spaces below ; four faint costals. In the left anterior wing the cell is closed as usual, where the right anterior wing has the cell open and the venation similar to the specimen of *O. ruficapilla* from Brazil. In both hind wings the venation is even more irregular.

Hab.—One specimen collected by Prof. Sumichrast on the Isthmus of Tehuantepec, Mexico, in the Cambridge Museum ; one specimen from Central America taken by Mr. Salvin at Chinautta, at 4,100 feet elevation, in McLachlan's coll.

I have no doubt that both specimens are identical, and have followed closely McLachlan's description ; the only difference would be that the basal joint of the antennae is black in McLachlan's specimen and reddish yellow in mine.

(To be Concluded in November Number.)

ENTOMOLOGICAL CLUB OF THE A. A. A. S.

The meetings of the Club at Ann Arbor were held daily from the 25th to the 28th of August, both dates inclusive, and were very successful. The following among others were present and in constant attendance :— J. A. Lintner, C. V. Riley, Herbert Osborn, John B. Smith, D. S. Kellicott, O. S. Westcott, L. M. Underwood, A. J. Cook, E. A. Schwarz, Henry G. Hubbard, S. H. Peabody, Clarence M. Weed, Miss M. E. Murtfeldt.

In the absence of Dr. Morris, Prof. J. A. Lintner presided. Officers for the ensuing year are : Pres., Prof. J. A. Lintner, of Albany ; Vice-

Pres., Mr. E. A. Schwarz, of Washington; Secretary, Mr. John B. Smith, of Brooklyn.

Aug. 25.—The following papers were read: A Biographical Sketch of William LeBaron, late State Entomologist of Illinois; Notes on some Structural Characters of the Lepidoptera, by John B. Smith. The Family Position of *Euphanessa mendica*, by Geo. D. Hulst.

Aug. 26.—Notes on *Harmonia pini*, by D. S. Kellicott; On the Preparatory Stages of an Undetermined Cossus, by D. S. Kellicott; On the Principal Injurious Insects of the Year, by C. V. Riley. Messrs. Kellicott, Underwood and Osborn spoke on the same subject.

Aug. 27.—Messrs. Cook, Osborn, Smith and Riley continued the discussion of injurious insects of the year. Messrs. Lintner, Riley and Westcott discussed the ease and difficulty of raising certain larvae. Mr. Osborn gave some notes on the habitat of a Chironomous; Mr. Cook gave some notes on the functions of the secretion of Bark Lice *(Leucanium tilia);* also some notes on the Choke Cherry Tortricid, *Cacœcia cerasivorana.* Mr. Westcott gave some notes on the abundance of certain Coleoptera.

Aug. 28.—Random Notes on Mallophaga, by Herbert Osborn; Larval Longevity of a Species of Coleophora; Extract from a letter of W. H. Edwards, on some food plants of *P. ajax;* On a Peculiar Structure of the ♂ *Cosmosoma omphale*, by E. A. Schwarz. How shall we Create and Foster an Interest in the Study of Entomology? by John B. Smith. All the gentlemen present participated in this discussion, which was of great interest.

The following committee of arrangements for the next meeting was appointed: Chairman, J. A. Lintner, and Messrs. John B. Smith and C. V. Riley. Adjournment to meet at call of the President at the next meeting of the Association.

LE NATURALISTE CANADIEN.

We heartily congratulate our esteemed confrere, M. L'Abbé Provancher, upon the re-appearance of his magazine after the lapse of many months, and we trust that henceforth all difficulties may be removed, and that the Government of the Province of Quebec will continue the assistance which we understand was formerly given to the Editor.

ERRATA.—Page 170, line 14 from bottom, read small *l* for *lithophilus;* specific name, not name of a genus. Same page, line 13 from bottom, for *Hestonotus* read *Xestonotus.*—C. H. T. TOWNSEND, Constantine, Mich.

The Canadian Entomologist.

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ENTOMOLOGY AT BRIGANTINE BEACH, N. J., IN SEPTEMBER.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

In the preceding volume of the ENTOMOLOGIST (vol. xvi., p. 186) an account is given of some of the Coleoptera found in September on Brigantine Beach, N. J.; and having been there this season from the 1st till the 18th of the same month, I propose to give a further account of some of the insects inhabiting that region.

Cicindela dorsalis Say is found in great abundance on the shore between the lines of high and low tide, keeping as close to the water as it can get. If too closely pursued it frequently takes wing, alighting in the surf and coming to the shore in the foam, from which it usually escapes before it can be taken. It is sluggish in its movements, running about a yard, then stopping, and so on alternately, and flying only when pursued, and then for but short distances. More than two-thirds of the females captured want either a part of an antenna or of a hind leg, these mutilations occurring on the right side in a large majority.

Cicindela hirticollis Say is likewise in as great abundance as the preceding, but does not mingle with it nor willingly pass the high tide line, inhabiting bare depressed places on the sandy beach surrounded by hillocks of white sand, on which it delights to bask in the hottest sunshine. It is a great lover of heat and light, and is sought for in vain except during a few hours of the warmest and brightest days. It is very wary and active, and by no means easily taken.

Cicindela repanda Dej. also occurs plentifully in bare places surrounded by grass, and on paths and roads where the ground is dark ; when disturbed it rises and lights a short distance off in the short grass, where it is easily taken before it can again arise.

Though inhabiting contiguous territory, the habits of these three species keep them socially separate.

On the main land other Cicindelas occur in abundance. On the 14th, while there, I took in less than an hour sixteen specimens of *C. modesta*, ten of *vulgaris*, and two of *generosa*, and saw many others. I had only to stand beside one of the many bare spots that are common in the pine woods, and throw the net over the insects as they came to bask in the warm white sand. In these woods I also met with several females of a fine, large *Mutilla (occidentalis)*, black beneath, bright scarlet above, with a black abdominal band. The specimen I took measured .90 inch in length, and though the temptation to take others of so beautiful an insect was great, being unfortunately without forceps, prudence gained from painful experience forbade.

Brigantine is inhabited by many species of Carabidæ, most of which are widely distributed and not confined to maritime regions.

Calosoma scrutator Fab. occurs alive frequently, but is likely brought from the main land by the waves.

Pasimachus sublaevis Beauv. is found sparingly, there being now scarcely anything for it to live and shelter under; formerly it was abundant. The same remarks are applicable to *Scarites subterraneus*. *Platynus punctiformis* Say is plentiful, living under all kinds of debris and decaying grass. With it is found in less abundance *Pterostichus erythropus*. *Amara subaenea* Lec. and *A. musculus* Say are of common occurrence. The latter is pollenivorous as well as carnivorous, being often taken on the spikes of grasses in flower, as well as in the vicinity of decaying animal substances.

Dermestes Frischii Kug. was found as usual, and in considerable numbers. It seems to have immigrated to stay.

Nitidula ziczac Say inhabits dead birds, which are often met with. These do not become putrid nor breed Diptera, literally drying up, and in this state becoming the abode of *ziczac*.

Sphenophorus retusus Gyll. Of this only a few specimens were taken in former years, but this season it occurred in the greatest abundance. The larvæ evidently live in the culm, or on the roots of the beach grass, *Calamagrostis (Psamma) arenaria*. This is a very coarse grass with a culm frequently .25 inch in diameter. The loose sand drifting among it forms hillocks four or five feet in height, the grass still shooting upward as the sand accumulates, and throwing out roots beneath to retain it. There is nothing else growing there on which they could possibly live. The beetles were found in multitudes from the first to the sixth day of the

month, but after that time very sparingly. They seemingly emerge around the culms of grass, crawling slowly over the loose sand till they find mates, and always directing their course upward towards the highest point, probably on account of its being the warmest. They appear to require sunshine, warmth and dryness, not being seen when it is cloudy, cold or damp. After pairing the males soon die and lie scattered over the sand, but whether the female goes into hibernation or proceeds to oviposit forthwith could not be ascertained. In the latter case there is ample time for the ova to hatch and the larvæ to be well developed before severe frost, which would rarely affect them before the middle of November.

Sphenophorus cariosus Oliv. A few specimens of this beetle were found with *retusus*, and its larvae presumably live on the same grass, but, if abundant, its time of development must be earlier.

Sphenophorus costipennis Horn is found sparingly in hibernation under sods around the sand hills, and likewise undoubtedly lives in the larva state on the roots of the same grass, there being nothing else to feed on within a reasonable distance.

The foregoing species of *Sphenophorus* seem to prefer dry situations where there is no more moisture than naturally belongs to the soil.

Sphenophorus placidus Say is, on the contrary, of a more aquatic habit, being abundant on the salt marshes, where its larvae undoubtedly live on the roots of a very fine short grass that grows there densely, and is saturated almost daily with the water of the incoming tides. In September the beetle is found in great numbers in hibernation under drifted timber that has become much imbedded in the wet soil and grass, where for much of the time it must be immersed in salt water.

Sphenophorus pertinax Oliv. Occasionally specimens are found with *placidus*, but more commonly it occurs in hibernation under sods left in dry places by the highest tides, seemingly requiring less moisture than *placidus*.

All the foregoing species of *Sphenophorus* seem to be widely distributed except *retusus*, which, so far as known, is strictly maritime and not often taken, at least there are few with whom I exchange whose cabinets I have not supplied.

LEPIDOPTERA.

The species found on the island are not numerous. *Pieris rapæ* Lin. is abundant, though cabbage is little cultivated. I found over a dozen of

the pupae on the beach under a small board, and on searching for the food plant, discovered the larvae had fed on the *Cakile americana*—a curious maritime plant, which though belonging to the Cruciferae, is very remote from the cabbage.

Callidryas eubule Lin. Specimens were observed on the wing nearly every day along the margin of the ocean, flying apparently at the height of fifteen or twenty feet and about the same distance from the shore, so that their capture could not be effected, though I took a crippled one and thus ascertained the species. All appeared to be southward bound, flying steadily but slowly.

Colias philodice is annually represented by a few specimens. In the absence of clover, the larvæ probably feed on an abundant native species of Phaseolus that seems in perpetual bloom, and of which the butterfly appears very fond.

Danais archippus Fab. The multitude of this butterfly that assembled here the first week in September is almost past belief. Millions is but feebly expressive—miles of them is no exaggeration. On the island is a strip of ground from 150 to 400 yards wide and about two and one-half miles in length, overgrown with *Myrica cerifera;* after three o'clock these butterflies coming from all directions, began to settle on the bushes, and by evening every available twig was occupied. To see such multitudes at rest, all suspended from the lower sides of the limbs, side by side, as is their well known custom, was something well worth seeing. One evening I travelled more than half the distance of their encampment, and learned that it extended the whole length and breadth of the bushes. In the morning they gradually separated and did not appear unusually numerous during the day, but in the afternoon they came again as described. I found them on the second, the day of my arrival, as related above, and this was repeated daily till the sixth, the forenoon of which was rather calm and sultry; a storm of wind and rain came on about two o'clock p. m., continuing till midnight. The next afternoon few came to camp; the great army had disappeared—but, how? when? where to? During the next few days they appeared again in considerable numbers—about as they had been observed in former Septembers—but insignificant when compared with those that preceded. The males and females were about equal in numbers. Not a single stalk of their food plant (Asclepias) grows on the island. On the main land, seven miles distant, I observed several patches of *A. tuberosa* in full bloom, but saw neither larva nor

butterfly; and as I learned that this plant is plentiful in that part of New Jersey, a scarcity of food will not account for this migratory habit. Neither will a scarcity of timber in which to hibernate, for this is superabundant. For a good account of this butterfly see Riley's 3rd Missouri Report, p. 143; American Entomologist, vol. 3, p. 101; CANAD. ENT., vol. 12, p. 37, 38.

Pyrameis huntera Fab. is quite common, its food plant *(Gnaphalium polycephalum)* growing there abundantly.

Deiopeia bella Lin. This pretty little moth flies in the hottest sunshine and is excessively abundant. The food plant of the larvæ is unknown to me, but the imago frequents the flowers of a maritime species of Solidago.

Spilosoma acraea and *virginica*. The larvae of these two species were seen, but not in great numbers.

Anthera polyphemus. The larvae occur in abundance, and might be collected by the peck from the Bayberry bushes, on the leaves of which they feed. There is a marked difference between the imagos produced from the coast larvae and those raised here, the former having the colors brighter and the red on the wings deeper and more extensive.

Hyperchiria io. The larvae are likewise found on the Bayberry bushes, but being a general feeder, it abounds on many plants, especially such as are cultivated. It is in bad repute with the natives, one of whom informed me that its "sting" was certain death in about fifteen minutes, the only remedy being several liberal "whiskies" taken immediately.

I noticed the larvae of three or four other species of Bombycidae, and a few Noctuidae; but the place does not seem to be congenial to many species of the latter family.

The hymenopterist would find several interesting things in his line there. I observed two species of small Mutilla living in colonies in the sand hills. There are at least a dozen species of sand wasps, all seemingly solitary and in constant search for prey. There is a black species about one inch in length that I have frequently seen pounce on an unsuspecting Crustacean (sand crab) of at least twice its weight, give it a quick stab, and then haul it rapidly off to its burrow in some convenient sand hill.

I close this paper with a brief notice of a young but very enthusiastic entomologist, whose acquaintance I formed there, Master Lewis Barber, two and one half years old, a grandson of the proprietor of the hotel. This young gentleman spends all his leisure time—all that is not occupied in eating and sleeping—in collecting insects in all orders except Hymen-

optera, and is never happy unless he has some living thing in his hand. He takes particular delight in catching that ferocious Dipter, the green-headed fly, which he dexterously holds by the legs, greatly admiring its buzzing, and can not be induced to go to bed without having one of them, or something else, in his fist. His captures are never killed nor tortured, but dexterously thrust into a tin box with a sliding lid, which he carries with him; there he puts what he calls millers, grasshoppers, crickets and bugs. When he takes anything, he examines it with as much interest and gravity as his older brethren. He has no fear, handling caterpillars and worms with great composure, to the intense disgust of his mother and his lady acquaintances, who say the more hateful and horrid a thing is, and the more it wriggles, he likes it the better. His admiration was unbounded when I presented him with a larva of *Polyphemus*. He cares little for the companionship of other children unless they join him in catching insects. This entomological disposition was manifested, his mother says, before he could crawl, and all her endeavors have not in the least tended to wean him from what she calls "such horrible and disgusting playthings."

Perhaps I am now writing the first page of the biography of a renowned entomologist of the future. Who knows? This sketch will recall to such as have read "The Life of a Scotch Naturalist, by Samuel Smiles," the childhood days of Thomas Edward, associate of the Linnaean Society. Those who have not, have neglected one of the most intensely interesting biographies ever published.

MONOGRAPH OF THE EMBIDINA.

(Continued from page 199.)

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

17. *Embia (Olyntha) Mülleri*, n. sp.

Wingless form, female? dry. Length of body 12 mill.

Body large, stout, black, very sparingly clothed with yellow hairs; shining, the head alone semi-opaque. Head large, flat, scarcely longer than broad, a little narrowed to the occiput; hind angles rounded; a shallow impression above with a short longitudinal engraved line; eyes black, small, not prominent; antennae only 21 joints present, which are as long

as head, pro- and mesothorax; black, with yellow hairs, the 10 last joints strongly polished; 1st stouter, cylindrical; 2nd short, annular; 3rd cylindrical, as long as first; 4th and fifth very short; the rest successively longer, nearly pyriform, the last ones about ovoid. Epistom half as long as broad, sides rounded, front margin widely notched; labrum large, a little narrower at base, front margin rounded and a little yellowish, as well as the sides of the epistom; max. palpi dark brown, villous, stout, compressed, the three basal joints short, equal, 4th longer, obliquely truncated at tip, 5th a little longer and larger, ovoid; labial palpi compressed, broad, 1st very short, 2nd about as long as broad, 3rd longer, the broad apex rounded. Prothorax a little longer than broad, behind a little broader; narrower than head; side margins nearly straight; a transversal sulcus after the apical third; a fine engraved median longitudinal line; mesothorax broader and longer, flattened; near the anterior margin a transversal impression; the anterior angles rounded, a little swollen along the sides; disk with a large shallow impression; metathorax quadrangular, shorter but as broad as the mesothorax; impression near the anterior margin stronger; anterior angles more inflated, behind them a transversal small furrow, as indication of a separation; in mesothorax and metathorax the anterior margin and angles pale yellow; the "segment médiare" connected with the metathorax short, rounded before. Abdomen flat, one third less broad than the thorax, shining, very hairy; dorsal segments alike, transverse, short, the last one larger, rounded; appendages large; basal joint short, broad; apical joint much longer, ovoid; the two last ventral segments with a median longitudinal deep furrow. I can not see a genital opening, these parts being shrivelled up. Legs strong, very hairy, black shining; fore legs reaching the tip of mouth parts, femurs long, compressed, dilated; tibiæ alike, shorter; tarsus with first joint shorter than tibia, bent to below, dilated with a median furrow; no spine; the two apical joints small, much shorter; middle legs similar but shorter, thinner, very little dilated; hind legs as stout as the fore legs, femur much dilated, tibiæ shorter, not dilated; tarsus short, yellowish, basal joint less than half of the tarsus, cylindrical, stouter than the following ones, of which the 2nd is very short, the 3rd as long as the 1st. I see no asymmetry of the end of abdomen, but those parts are not in good condition.

Hab. One specimen from Itajahy, S. Cattarina, S. Brazil, collected

1879, by Dr. F. Müller, to whom the Museum is greatly indebted for interesting specimens and biological notices.

The specimen arrived in a letter, and is a little crushed, perhaps flattened. It is the only wingless specimen of Olyntha seen by me. I suppose it to be a female, because no male genitals between the appendages are to be seen, and the last ventral segment has a longitudinal furrow (or is perhaps split). There is no female of Olyntha known; if the females are colored like the males, this specimen belongs to a new species. The apparent indication of wings looks decidedly as when they are abortive and will never be developed. Therefore it can be assumed that the specimen is a female imago, or if winged females should exist, a wingless form similar to those of the Termitina.

HISTORY OF THE FAMILY.

Latreille, Familles nat. du règne animal, Paris, 1825, p. 437, at the end of the Termitines, says: "Les genres Termès, Embie (voisin du précédent, mais à antennes différentes)." In the German translation by Dr. Berthold, 1827, p. 435, the French expression Embie is given as Embium. Latreille, in Cuvier's Règne Animal, new (2nd) edit., 1829, vol. v., p. 256, states in a foot note: Some insects of the southern parts of Europe and of Africa are related to Termes, but with the head broader than the prothorax, three-jointed tarsi, wings not longer than the abdomen or none, with compressed legs, the two anterior tibias (sic!) much broader, without ocelli, and the thorax elongate form, the genus indicated in the Familles Nat. with the name Embie (Embia). It has been figured in the large work on Egypt. Indeed the celebrated Savigny, in Descr. de l'Egypte Zool. Neuropt., pl. 2, f. 9 and 10, had figured one species with numerous details (*E. Savignyi* Westw.) The plate was drawn and engraved between 1805 and 1812, but not published before 1825. There are on the plate only the names of the families, even the Termitines wanting among them, but no names of the species. In the meantime the unfortunate Savigny had become blind, and an Explication Sommaire of the plates by V. Audouin was published in the last months of 1825. The note concerning Embia is as follows: "The two insects, figs. 9 and 10, form a new genus, named by Latreille, Famil. Nat. p. 437, Embie, which he places near Termes. M. Savigny has established the same relation by placing Embia on the same plate at the side of Termes." I may remark

that the two insects of which V. Audouin speaks belong to one and the same species; fig. 9 represents the insect from above, fig. 10 from below.

Mr. R. Gray, in Griffith's ed. of Cuvier, vol. xv (Insects, vol. ii., 1832) p. 346, translates Latreille's note and describes briefly a new species from Brazil as a new genus, *Olyntha Braziliensis*. It was separated from Embia by having the antennæ as long as the body, the thorax much longer and more separate from the head, which is rounded posteriorly, the terminal joints of the palpi rather longer. It is figured (magnified) on pl. 72, f. 2, by Westwood, and named on the plate *Embius? Braziliensis*, J. R. Gray. The type formerly in Mr. Children's collection is now in the Brit. Museum.

Prof. J. O. Westwood in Trans. Linn. Soc. Lond. 1837, vol. xvii., p. 369-374, pl. 1 (read March 4th, 1834) published: Characters of Embia, a genus of insects allied to the white ants (Termites), with description of the species of which it is composed. He describes three species which he places as three sub-genera of the genus Embia, after single specimens, one of them, *Embia Savignyi* West., only after Savigny's figures. The second, *Oligotoma Saundersii* Westw., from Bengal (the type now in the Brit. Museum); the third, *Olyntha Braziliensis* Gray, formerly described in Griffith. The sub-genera are divided in such with 5-jointed palpi, antennæ shorter than the prothorax, with less than 20 joints (Embia and Oligotoma), and with 4-jointed palpi, the antennæ about as long as the body; the 4th vein trifid (Olyntha). The first group was divided by the 4th vein trifid (Embia) or bifid (Oligotoma). The numerous details figured give to his work a permanent value. The genus Embia is said to combine Termes with Eusthenia, a Perlid; why is not stated.

Burmeister, 1839, in his Handb., vol. ii., p. 768, elevates his four species to a family of equal value with the Termitina, and brings the Embidæ to his Tribus Corrodentia. He describes four species, one new, *O. ruficapilla*. But his *O. Braziliensis* is not Gray's species, and belongs to *O. Batesi* McLachl. He corrects the number of the joints of the maxillary palpi by Westwood for Olyntha, which has indeed five joints, as the others. Burmeister elevates the three sub-genera of Westwood into genera.

Rambur, 1842, Neuropt. p. 310, places the Embides as a family near the Termites. His general characters are excellent; only four species are described, and very well. Three of them are believed to be new, but his *Emb. Latreillii* is *O. Saundersii*, and his *E. Klugii* probably *O. rufi-*

capilla. The last one, *E. Solieri*, from Marseille, is only known in the wingless state. Rambur disbelieves that Oligotoma and Olyntha are generically different from Embia.

Hagen, 1848, had composed a review of the literature concerning the Neuroptera *(sensu* Linn.) ; the part containing the Embidina was printed February, 1849, Stett. Ent. Zeit.

Mr. H. Lucas, in his splendid work, Expl. scient. de l'Algérie, has described and figured his new species, *Embia Mauritanica*. This publication and the later one in 1859, have in fact opened the way of a better knowledge of this interesting family. Nothing was known before on the habits and nothing on the internal anatomy and the sex of the species. As the expensive work of Mr. Lucas is not accessible to students, I prefer to translate the following important passage given in a foot note, vol. iii., p. 112 :

As I liked to know to which sex belongs this (winged) form, I dissected several specimens (only 12 were collected). The ovaria are very elongate, covered by a very fine membrane, made more resistant by longitudinal fibres, giving a striated appearance. The ovaria are united internally, forming a kind of very elongated parallelogram, which covers the intestina in the whole length of the abdomen. The egg tubes are straight, parallel, very long, thick and fusiform ; toward the thorax the tubes are successively thinner, prolongated in a thread, which is attached together with the fibres to the first segment of the abdomen. Toward the end of the abdomen the tubes are recurvated suddenly at their hind end to form combined a very short oviduct, nearly null, with many lateral tubiform vessels, which are very irregular, nodulose, embracing themselves and recurvated in all directions (Lucas).

Mr. Lucas states after the result of his dissections, that all twelve winged specimens at his command are females, and that all showed the same asymmetry of the last segment of the abdomen and of the appendages. The winged male is still unknown. I have to remark that the females of *E. Mauritanica* are the only known winged females and the only known with asymmetry of the tip of the abdomen. McLachlan, l. c., p. 382, has stated the three specimens of his *E. Persica* as questionable females (all ♀?), but does not say why, nor does he mention symmetry or asymmetry of the tip of the abdomen ; therefore more detailed information would be desirable.

The detailed description of the ovaria by Lucas is also very important

for the systematic position of the Embidina. Indeed it disposes for ever of the claims of relation with the Perlidæ, of which the peculiar and very different form of the ovaria is well known. The ovaria of all groups of the Orthoptera are different, as far as known to me, and among the Pseudoneuroptera the Psocina differ also entirely. The only related form of ovaria we find among the Termitina, and indeed the inner organs of a virgin female of Termes is as similar as if the description by Mr. Lucas had been made after one of them. I think this similarity speaks indeed very strong in favor of the place of the Embidina near to the Termitina.

It should be remarked that the vol. iii. of the Expl. scient. de l'Algérie, though it has on the title page 1849, is published later. At least De Selys Longchamps Revue des Odonates d'Europe, preface February 24, 1850, was not able to give the pages and plate of the Odonata described by himself for this work (f. p. 315, 318, etc.), and the Odonata in the Exploration follow the Embia.

For the only known facts up to the present concerning the habits of Embia, their living in silken tunnels spun by themselves, by the wingless and by the winged form, we are indebted to Mr. Lucas in the Explor. and in his later paper, Ann. Soc. Ent. Fr., 1859, and the corroboration of the same for *Emb. Latreillei*, ibid., 1883. He believes these insects to be carnivorous.

Fr. Walker, 1853, List of Neuropt. in the British Museum, p. 529-533, copies mostly Burmeister. Of the eight species mentioned, one is new, *Olyntha staphilinoides* from Brazil, but it belongs to Forficula.

Hagen, 1866, Verh. Zool. Bot. Gesell. Wien., collected in his Synopsis Embidinorum all known to him about these insects. He enumerates eleven species, two of them probably synonyms, two without description. Only seven were considered as doubtless.

Mr. R. McLachlan, 1877, Linn. Soc. Journ., vol. xiii., p. 373–384, pl. 1, published a paper which gave a new and strong impulse to the study of this remarkable family—"On the Nymph-stage of Embidæ, with Notes on the Habits of the Family." He had the good chance to study living insects imported with an East Indian orchid. The carnivorous habits of Embids, accepted on the authority of Mr. Lucas, became at least doubtful, as this species makes depredations on the roots of orchids. McLachlan gives a review of all known and published on Embids, and describes four new species, *Oligotoma Michaeli*, *Embia Batesi*, *E. Salvini*, *E.*

Persica, so that in all eleven are known. The genera Embia and Olyntha are again united, and separated by its trifid sector from Oligotoma with a bifid one. I have before under *O. Michaeli* given the details of this communication, and may only repeat that the so-called nymph (when the description and the figures are correct) can not be a nymph, because the characters of the wing cases of a nymph are not present. Perhaps it is a short-winged imago. Later he has described *O. insularis*, a new species from the Sandwich Islands.

Mr. Wood-Mason, 1883, Proc. Zool. Soc. Lond., p. 628-634, pl. 1, published "A Contribution to our Knowledge of the Embidæ." His attention was drawn to this group by McLachlan before his return to India. The memoir is very interesting, but there is left enough for further observations. After the perusal of the literature he had formed the opinion that the females were still unknown, and that they would prove to be wingless and probably larger in size. Of course he has not known Lucas's work, in which by dissection the female sex of winged imago had undoubtedly been proven for *Embia Mauritanica*. He discovered larvæ of a species apparently living in society. All were males probably of *O. Saundersii*. None of them showed the slightest traces of wings, but as the size of the specimens is not recorded, the larval state is at least not yet sure. He discovered also a large wingless female of *O. Michaeli*. I have before discussed this female, which seems to be doubtless a female imago, though its belonging to *O. Michaeli* is still a conjecture. He describes the male sexual characters of *O. Saundersii*, and speaks at some length about the wings of the same species, giving enlarged figures of the venation. I have to say more about them in the chapter treating the characters of Embids. A paper promised on the differences between the Embidæ and the Perlidæ has not yet been published. He considers the Embidæ as belonging to the true Orthoptera, being in some respects the lowest term, and in others the lowest term but one, of a series formed by the families Acridioidea, Locustidæ, Gryllidæ and Phasma.

I have now described seventeen species, only two of them I have never seen *(E. Mauritanica* and *E. Persica)*, and three are now not before me *(S. antiqua, O. Braziliensis, O. ruficapilla)*.

Characters of the Embidina.

Head.—The head is nearly free (caput liberum); the foramen occipitale is not just at the end of the head, as in Raphidia, but a little before and below; the membranous part of the prothorax slides gently to the

foramen. Head horizontal, small, flat, a little convex above, obovate or more or less quadrangular ; the Y-shaped suture, so common in Termitina, Psocina, etc., on the upper side is entirely wanting ; the eyes are always in the front corner, whereas in the other families they are placed in the middle of the sides or in the hind corner of the head. The eyes of the winged forms are large, prominent, reniform, the facets globose as in aggregate eyes ; the eyes of the wingless forms are smaller, not prominent, and the facets flattened as in the composite eyes ; therefore the head of wingless forms looks different, and is more ovoid ; ocelli are wanting, but some species show a very small impressed line or groove, which calls to mind the obliterate middle ocellus of Blatta. The antennæ are as long as the body (Olyntha) or shorter, reaching the end of the metathorax or only the prothorax ; the antennæ of the wingless forms are always shorter ; they (antennæ) are inserted in a little socket in the anterior excision of the eyes ; 15 to 32 articulated, but so fragile that it is difficult to find a specimen with the same number of joints on both antennæ ; the basal joint is always somewhat stouter than the others, cylindrical ; 2nd joint always very short, annular, 3rd joint always about as long as the 1st, and commonly followed by three shorter joints ; all the following are longer, thickened toward the tip, or pear-shaped ; the last one more or less ovoid. The epistoma is short, broad and united with the labrum by a membranous rhinarium ; the labrum is large, nearly orbicular, cut off at the base ; or it is more quadrangular, broader than long, or shorter, largely rounded in front. The mouth parts, at least the palpi, exceed a little the labrum ; mandibles strong, horny, with two to three teeth on tip ; maxilla narrow with two teeth on tip ; outer lobe narrow ; palpi longer, strong, 5-jointed (4-jointed in Termitina and Psocina), the three basal ones short, equal ; the last joint much longer, ovoid ; 4th joint always shorter than the 5th, but sometimes about as long as the 3rd. Labium bilobed, large, sometimes (I have not material enough to decide this positively) with two very small pointed lobes between them. They are mentioned by Burmeister, l. c. 769, and are to be seen in two of the species in Westwood's figures. On the basis of the upper side of the labium is a long middle slit (as in Psocina), the opening of the spinning glands. It is figured by Savigny, l. c. pl. ii., f. 9, u. e., but not mentioned in the description, nor anywhere else. I am not sure if the inner pointed lobes mentioned before belong to the spinning apparatus ; perhaps the homologous large inner lobes of the Termitina have been here and in Psocina transformed into a spinning

apparatus. The mentum is large, oblong or quadrangular, and inserted in a sharply-cut opening of the head.

Prothorax much narrower than head, long, enlarged behind, with sharp straight side margin; after the first third a transverse deep sulcus, mostly prolonged behind along the side margin; the part before the sulcus corresponds to the similar but broader part which covers the occiput in Termitina; the hind part is a little convex; a sharp impressed middle line often runs along the whole prothorax. The mesothorax and the metathorax are larger, quadrangular and about equal in the winged forms; on the tergum is a large triangular elevation, to the sides of which the hind part of the wings is attached by a membranous fold. The tergum of the wingless form is without this elevation, and among those forms the mesothorax may be larger than the metathorax. Each segment of the thorax is divided into three parts.

The wings are horizontal, of the same shape and size, long, narrow, three to four times longer than broad, rounded or elliptical at the apex, as long as the abdomen, or somewhat longer in Olyntha (I have seen no alcoholic specimens of Olyntha). The wings are not deciduous as in Termitina, a basal squama being wanting; indeed the wings are so strongly attached that I have never seen a specimen dry or in alcohol which had lost a wing. The attachment is made by the callus axillaris anterior, just on the side of the anterior angle of the mesothorax, and by the callus axillaris posterior a little behind the former and more dorsal; the membrane of the hind margin of the wings is firmly attached by a membranous fold along the whole margin of the ob-triangular tergal elevation; the same attachment is found in Ephemerina, and is homologous to the membranula accessoria of the Odonata. The callus ax. anterior sends a strong vessel in the wing, forming the subcosta and the mediana; the callus ax. posterior sends from beneath in the wing the submediana and the post-costa. I was not able to find tracheæ in the wings or veins. The costa, which is a real vein, originates from the subcosta; the vein along the hind margin can be followed mostly to the middle of the wing, and originates from the post-costa. The membrane of the wings is more or less rugose, similar to the wings in the group of Calotermes, including *C. verrucosus*, *pusillus*, *rugosus* and related species. The rugosity is effected by numerous little pits bearing a very small hair in the centre they are more frequent and more densely placed on or near the veins, and seem then to form a kind of socket; a series of longer hairs is found on

the veins, or indicate their place when the veins themselves are obliterated. By means of these series of longer hairs there can be located between the submediana and post-costa three obliterated, or rather undeveloped, veins in *O. Westwoodi*. I can not find any sure trace of the sieve-plate, which is common at the base of the wings of the Psocina, unless it is represented by a short double series of approximated larger holes near and partly upon the base of the post-costa. The coloration of the wings is remarkable, being blackish, fuscous, fuliginous, or at least fumose, with five narrow white longitudinal bands between the veins. As these bands follow longitudinal folds or deepenings of the membrane between two veins, they perhaps represent undeveloped veins. But I was not able to discover a series of longer hairs in these white bands. Moreover the smoky dark wings of the Termitina with a number of undeveloped veins, never show similar white bands, which indeed seems to be characteristic for Embidina. The ingenious assumption of Mr. Wood-Mason, l. c. p. 633, that the white bands represent the original hyaline color of the wings, and that the dark veins are broadly bordered on both sides with brown or black-smoky, as to leave only narrow streaks of the ground color visible, is worthy of consideration. Of the veins, the sub-costa on its origin and the post-costa are usually the darkest and largest ones, but the mediana is the largest in its whole length except at base. The mediana is accompanied on both sides by a dense series of rugosities which form (Olyntha) together with both margins of the mediana, four approximated blackish lines.

With the intention to make my descriptions easy for comparison and to avoid any confusion, I have always used the names of the veins given in the descriptions of Westwood, McLachlan and Wood-Mason. I give here the nomenclature of the veins used by me in all my neuropterological papers since 1846, because the origin and the comparative value, and the homology of the veins, become more evident. My detailed paper on the wings and veins of the Odonata, made in 1846, was to be printed at the end of the monographs on Odonata, and the nomenclature was accepted by De Selys-Longchamps and used in all subsequent papers. The monographs of the four sub-families still wanting were interrupted, and the parts ready for the general volume (wings, antennæ, legs) remain still unpublished. I had then of course not known the nomenclature used by Heer, in which Kirby's names are partly accepted, as his work was published in 1847. As Heer's nomenclature has never been used except in

some papers on fossil insects, I have used my own, and have given, Stett. Ent. Zeit., 1870, a more general paper on the rational nomenclature of the venation in the wings of insects. The plate accompanying this paper was made at my request by my old friend, Zeller, as I was then on a long voyage. The numbers and the f. at veins on the plates are all Prof. Zeller's, and very different from my views. As the plate had been published before my return, it has not been given any explanation, because the plate did not illustrate my views.

I may add that I have studied carefully Dr. Adolf's recent papers on veins of insect wings, in the hope of finding a better explanation for the aborted or undeveloped veins, but without success. The costa runs as a true and strong vein along the anterior margin to the middle of the rounded apex of the wing, where it is commonly connected with the submediana. The costa is incised at its extreme base ; the very small part before this incision, which lies not exactly in the same line with the costa, is, together with the very minute part below it, homologous with the basal squama. The sub-costa is the strongest and darkest vein, straight, ending free in the basal third of the length of the wing, somewhat earlier in the hind wings. I am not able to confirm (even from wings in alcohol) Wood-Mason's statement that it would, if produced far enough, run into the costal vein. Sometimes it seems indeed more directed to the costa, but in other species *(O. Westwoodi)* it seems to run to the sinus of the mediana.

Out of the mediana (radius) originates at its base below the subcosta, and a little before it above the costa ; the mediana runs as a very large and diaphan vein (the subcosta is not diaphan) parallel to the costa to the apex of the wing. Shortly before the apex the mediana is bent down and united in a curve with the submediana. Out of the mlddle of this curve runs a straight, short vein to the apex, which as I believe belongs to the submediana. An abnormal specimen of *O. atricapilla* and both specimens of *O. Westwoodi* do not possess this curve in all the wings ; the mediana is connected by a straight transversal with the submediana, and ends shortly after this transversal obliquely in the costa. The mediana runs in the middle of a large sinus, "studded thickly on each side with microscopically minute setæ" (Wood-Mason), or between two sinuses following its whole length. I can not decide which view is better to be accepted, but I remark that a somewhat analogous sinus is to be found in a part of the wings of Psocina. I have remarked before that the four dark parallel lines described and figured for this place are formed of the

margins of the mediana and of the sinus. There are sometimes between mediana and costa in the apical part of the wing four or more not well defined transversals, and between the mediana and submediana four or less well defined transversals; as far as I am able to see, all these transversals are only connected with the sinus and not with the mediana itself.

The submediana (fourth vein, or forked fourth vein, Westw., McLachl.) enters the wing from below as a strong vein, and sends from beyond the base, before the end of the basal fourth of the wing, a much stronger vein, the post-costa, obliquely to the hind margin. The submediana runs parallel to the mediana as far off as these veins from the costa. The submediana runs straight to the tip of the wing; the part of this vein which is called by McLachlan the upper branch of the sector, is in fact the submediana itself. This is proved by *O. Westwoodi*, where the part considered as fourth sector is obliterated, and the part considered as upper branch is well developed. The abnormal specimen of *O. ruficapilla* shows the same arrangement. After all, as far as I know, when veins are partly or totally aborted, the branches are first to disappear, and are followed by the main stem. Therefore we have to call the vein which is again furcated after the middle of the wing the lower branch of the submediana. The space between the mediana and the submediana, closed by a curve before the apex of the wing, is properly called the elongated cell or discoidal cell, and is only wanting in *O. Westwoodi*. There are some, but always few (3 to 5) transversals in the cell. The lower branch may be bifurcated again (Embia, Olyntha), and in abnormal cases the branch also bifurcated, at least in one wing. In the spaces between these branches and below them are a few scattered transversals without much regularity. Near the base the submediana is connected with the mediana by a very short transversal (between 4^1 and *c* in fig. 2, Wood-Mason, l. c.) in the hind wings about opposite the origin of the post-costa, in the front wings a little later. This short transversal vein, examined with the microscope, is found to be combined of two branches, one originating from the mediana, and another from the submediana. The first one crosses the last one, and a series of hairs following it shows an undeveloped vein (the rudimentary first branch, fig. 3, *c*, Wood-Mason, l. c.) This connection is homologous to the arculus of the Odonata, or the cross on the base of the front wings of Palpares, etc. Such a connection is often found present, when the wing is to be stiffened for a more powerful flight, or to give to a delicate wing more stability. This connection is not always

exactly the same in Embia; in some specimens the two little branches seem to anastomose one with the other; sometimes the basal part of the submediana seems to be separated, or at least turned in an oblique angle; but I think after all that no serious objection against my explanation can be made. The post-costa is a very strong vein, running obliquely to the hind margin; from this point to the base of the wing runs a fine straight vein, the anal vein.

The whole large group of Orthoptera is very multiform. There is no help for the systematic student, if he is displeased by this multiform mass; nature has created it in this manner, and he has to accept it just as he finds it. Erichson proved some forty years ago that the so-called Pseudo-neuroptera belong to the Orthoptera, and every later careful study has but confirmed his views. It may not be amiss to state that I had in my manuscript of the Synopsis of the N. Amer. Neuroptera (sensu Linnaei) separated in a decided manner the Pseudo-neuroptera from the Neuroptera, as this is not so evident as it should have been in the printed book. The whole group of Orthoptera consists of a number of co-ordinate families, of which no connecting living forms are known to exist; probably they have perished in former times. This is far more conspicuous among the Pseudo-neuroptera, and indeed there is not a single living form known about which it is uncertain or doubtful if it belongs to Perlina, Ephemerina, Odonata, Psocina, Embidina or Termitina. To arrange these families, which are very different among themselves, with the small or large number of genera and species belonging to them, in an acceptable series, is still impossible.

After a detailed study of the wings of the Embidina, only the following statements can be given. Only the Termitina and Embidina have all four wings of the same size, shape and venation; some small differences among them are not of importance. The longitudinal veins have the same simple arrangement, or even more simple because less branched in Embidina. The most striking difference is the strongly developed basal squama of the deciduous wings of the Termitina; this squama is indeed wanting, or rather very faintly indicated in Embidina. The sub-costa ends suddenly in Embidina just as in Psocina, though it is complete in Termitina. The mediana in most of the cases is connected with the submediana before the apex in Embidina; among the Termitina only *Calotermes brevis* (Hagen, Monogr. Term. Linn., vol. xiii., pl. 3, f. 6) shows a somewhat analogous arrangement. The basal connection between the

mediana and submediana to stiffen the wings in Embidina, would be out of place in Termitina, where the strong horny basal squama served this purpose better. Nevertheless in some species such a connection seems to be faintly indicated upon the squama. Some Termitina (Calotermes) have also a small number of transversals below the mediana, and some have ill-defined transversals below the costa before tip. The structure of the membrane of the wings and of the veins is similar in both families, and unlike the structure of all other families. Finally, though the wings of Termitina are considerably longer than the body, and only as long as the body in Embidina (a little longer in Olyntha), there is, considering the wings, no place more natural for the Embidina than near the Termitina.

The legs are a very striking and abnormal feature among the characters of the Embidina; they are obviously shaped for burrowing by the compressed enlargement of some parts of these limbs. I have compared them with the burrowing legs of insects of other orders, and was rather astonished to find a very great difference in the arrangement, the attachment and the development of the fossorial limbs and their joints. I have tried without success to find in the literature some general considerations or descriptions of fossorial limbs. As their shape must be the consequence of purely mathematical principles, a general study of these limbs is still an important desideratum.

The legs of the Embidina are strong, the middle legs always considerably less than the other pairs; all the legs are comparatively long, the fore legs exceeding the head, the hind legs reaching nearly the end of the abdomen, at least longer than two-thirds of it; the legs of wingless forms are always shorter. All three pairs are equidistant and attached to the end of the respective segments; but the bases of the fore and middle legs are as far distant from each other as possible, indeed the legs are attached to the sides of the thorax. The hind legs, on the contrary, are approximate one to the other, so that the coxæ are very nearly touching the opposite ones, and are longer and broader than the coxæ of the two anterior pairs, which are short, cylindrical, a little incurvate. The fore legs have the femur, the tibia and the first article of the tarsus of about equal length and strength, dilated and compressed; the first article of the tarsus rather more dilated, depressed, incurvated, with a furrow above; the two other articles short, the first of them more or less thick; the claws are short, sharp and simple; between them is no plantula. The middle

legs are shorter, thinner, the femur somewhat inflated at the base above; the tibia and the first joint of the tarsus about cylindrical. The hind legs have the femur strongly compressed and dilated; the tibia strongly cylindrical; the basal joint about half as long as the tarsus, a little stronger, and with an external comb of short spines. I do not know if this comb is present in all species; the two apical joints similar to the middle legs, perhaps a little longer. In some of the wingless forms the first joint of the tarsus of fore legs has a strong external spine.

Are the fore legs burrowing legs? Till now no observation is recorded, though their form admits the supposition. That they give help in the spinning of the silken tunnels is very probable. Are the hind legs jumping legs? No observation is recorded, but they seem fitted for jumping.

Comparing the legs of Embidina with those of Termitina, no similarity or relation is to be found. The trochanters in all pairs are very and equally approximate in Termitina. Among the Psocina we find in *Atropos divinatoria* the trochanters of the two first pair widely separated one from the other one, and those of the third pair much more approximate. For other families a comparison seems of no avail, but there exist similar distances in Odonata nymphæ, in Ephemerina and Perlina. Inflated legs are not known among Pseudo-neuroptera, except in Ephemerina in the earlier stages, and these are burrowing legs.

The abdomen is long, about half the length of the body, a little less broad than the thorax, flattened above, cylindrical below; the dorsal segments about equal, transverse-oblong, more than twice as broad as they are long; last segment longer, the two before mostly shorter than the others; there are seemingly ten dorsal segments, but the first belongs to the metathorax (segment mediaire), therefore only nine belong to the abdomen; the dorsal segments are strong, chitinous, and united on the sides by a large membrane with the ventral segments; a longitudinal fold bearing the stigma. The ventrals are more hyaline, except the two last ones of the males, on which the internal genital organs are situated; these two are stronger for support, usually darker colored, and polished. All the others are mostly diaphanous, so that the corda ventralis and its ganglia are visible, sometimes even partly the other organs situated in the abdomen. If the segment mediaire is not counted, there are eight ventral segments. Between the last segments of the abdomen are inserted the anal appendages. They are two-jointed, stout, very hairy, as long as the two last

segments, or shorter (Embia), the apical joint thinner, cylindrical. If asymmetry is present, the left appendage has the basal joint shorter, larger, sometimes almost quadrangular. Between these appendages are situated the external genital organs of the male. They consist of a middle more or less inflated conical or cylindrical membranous part, with a circular opening on tip, representing probably the intromittent organ; on each side is a horny spine, long, narrow, more or less pointed and twisted, asymmetrically in a different manner. The spine of the right side seems to present its regular more or less straight form; the left spine is twisted similar to a corkscrew in its apical half, and so nearly approximates to the intromittent organ that it is clearly to be seen only in alcoholic specimens. In all males, where these characters could be well seen (at least in Oligotoma), more or less asymmetry was evident, and McLachlan, l. c. p. 378, is of the same opinion. The last dorsal segment of the males is also asymmetrical, with a deep impressed fold nearer to the right side, and the apical margin is cut obliquely; the last ventral segment is also asymmetrically protruded. My description of these parts is made only from winged males, but Wood-Mason, l. c. p. 630, says that the larvæ of *O. Saundersii* collected by him in numbers at Jubbulpore, and without the slightest traces of wings, possessed all the same characteristic asymmetry quite apparent, which he considers exclusively confined to the male sex. He adds that "the asymmetry of the tergum of the terminal abdominal somite and of the cerci in *Necrosia maculicollis* (Phasma) appears at the corresponding early stage, and is in nymphs quite as strongly marked as in perfect insects." I am sorry that this insect is not at my disposal, nor can I compare Westwood's Oriental Cabinet. In his catalogue of Orthoptera, Westwood does not mention any asymmetry. I think that the shape of these organs is never expressed in the larvæ in a similar manner as in the imago and in the nympha. Till the contrary is proved, there must remain some doubt if these so-called larvæ do not perhaps belong to a wingless form of the imago.

I have not seen winged females, but in the wingless female, which is said to belong to *O. Michaeli*, and in *Olyntha Mulleri*, no asymmetry is apparent. Not one of the few wingless forms before me considered to be larvæ, is asymmetrical, but those parts are mostly too much shrivelled up in dry specimens to enable one to be certain.

The female opening is at the base of the notched 7th segment, similar to those of the Termitina. The same arrangement of the genitals of the

males among Pseudo-neuroptera is only represented among Perlina and Ephemerina, but without any asymmetry, which appears among the true Orthoptera in Blatina, and after Wood-Mason, also in Phasma.

The Different Forms and Stages.

Of the seventeen species described, three are only known as wingless forms; of the fourteen winged species, not one is known as winged in both sexes. Winged females are known with certainty only in *E. Mauritanica*, and questionably in *E. Persica*. Winged males are known for the first to seventh species of Oligotoma, and probably for *E. Savignyi* and *Olyntha Salvini;* for the three Olyntha, species 13 to 15, the sex is unknown.

Of the three wingless species, one seems to be a female imago; that it belongs to *O. Michaeli*, as Mr. Wood-Mason contends, still needs proof.

The specimen which was described as a nympha, can not belong to this stage, if the description and the figure are correct, as I have stated before. Very probably it is a so-called short-winged form, similar to those known of Termitina, Psocina and Perlina.

The figure of *O. Michaeli* in Gardener's Chronicle, 1876, p. 845, if correct, can only be considered as a nympha; the anterior wing cases are wanting or perhaps aborted. The *O. Müller*i looks as if it is an imago, with the anterior wing cases aborted and the posterior ones very slightly indicated. It has to be assumed that such forms exist among the Embidina as well as in the Psocina. At least I know of no other reasonable explanation. Concerning the larvæ, or the forms called larvæ, I am perfectly at a loss how to separate them from the winged imago, to which they have been assumed to belong, as about all are of the same size with the imago without any traces of wings. The head of all which I have seen has the characters of a female head. I have stated before that the so-called male larvæ of *O. Saundersii* are somewhat doubtful, and perhaps a wingless state of the male imago. Nevertheless, not having seen them, conjecture may be out of place. The larva of *E. Mauritanica* which transformed in the box, as reported by Mr. Lucas, belonged undoubtedly to that stage. As it must have gone through the nymph stage with wing cases, of which no record is given, an important gap is still to be filled. That there exist larvæ and nymphæ of Embidina is doubtless, but we have to confess that the knowledge of these stages is still a *tabula rasa*.

Habits.

We know only of one single instance in which the winged females of *E. Mauritanica* were found gregarious. The absence of males among them is not without example; among Psocina I have observed at least in three species a very large number close together, all being females. In one flock I secured among hundreds of females, by very careful examination, only one male. I believe the same fact has been recorded of some Hemiptera.

Another isolated observation exists of larvae, and this time all males, being found gregarious on a sandy place among old bricks, by Wood-Mason. Many observers state that *E. Solieri*, discovered in many localities in southern France and Spain, and by no means rare, lives always isolated. The same is recorded of *O. nigra* by Prof. Schaum.

Mr. Lucas was first to observe that the Embidae imago and larva spin silken tunnels. It is doubtless true that the spinning is done with the mouth, as by Psocina (though this has never been observed or stated), as the spinnerets open on the labium. Probably these tunnels induced Mr. Lucas to assume that the Embidina are carnivorous, and to put insects for food in his boxes, but he has not stated that the food was used. The observation by Mr. Michael seems to prove that these insects are phytophagous. Perhaps they are both; at least I may remark that for Gryllotalpa the same uncertainty still exists.

Every one asserts that all Embidina are very agile in running and flying. It will be agreed that our actual knowledge concerning their habits is no more satisfactory than that concerning their forms and stages.

Distribution.

There is little more known than has been given by McLachlan, l. c. p. 379. The amber species belonging to the tertiary layers is very rare among amber insects. Compared with Termitina in amber, perhaps one Embia is found for one hundred of the former. The fossil species differs in nothing from the living ones. Whether the species in copal are fossil or not, is still an open question. There are many copal insects which seem to be or are identical with living forms. But large quantities of copal, principally near the coast of East Africa, are dug out of sand or earth, just as amber, and in localities where no copal trees are now to be found. (J. Kirk, Journal Linn. Soc., June, 1868): "At the diggings are

not found any copal trees (Wm. E. Hines, Trans. Amer. Geogr. Soc.), or even any signs of any, and to this time it is a mere conjecture in what ages these deposits of copal were made, probably many thousand years ago." I can not give the exact quotation, as I have before me only a manuscript copy of this paper, written before 1860.* Some insects out of this copal, called in trade Zanzibar copal, but of the Zanzibar copal which was only exported to East India and not to Europe, seem to be identical with insects living in Ceylon. It can therefore not now be assumed that the *Embidina* in copal are still living forms, and that they belong to the fauna of Africa till the identity with living or African insects has been proved.

Considering that only fifteen living species are described by me, it will be seen that I have been purposely as careful as possible in making new species. I could have enumerated six species more, against which with our actual knowledge little objection could have been made. The type of *E. Klugi*, in Paris, must be examined to confirm its identity with *O. Atricapilla*. That of *O. Saundersii* should be compared again with *E. Latreillis*, with the specimens from Borneo and those collected by Wood-Mason, to make their identity certain. The type of *O. Batesii* and *O. Braziliensis*, Burm., should also be compared concerning their identity. The larva from Athens and from Asia Minor could have been given as new species, if it were desirable to describe new species upon such material. Finally the supposition that the large wingless female belongs to *O. Michaeli* needs the support of further careful observation.

Of the fifteen living species described, *O. Saundersii* has by far the largest distribution, Bengal, Borneo, Madagascar, Mauritius and Ascension Islands. *O. Insularis*, from Sandwich Islands, is, perhaps, to be found in Antigua Island. *E. Solieri* is not rare in South France and Spain. The other twelve species are only recorded from one locality. From Bengal, *O. Michaeli;* from Persia, *E. Persica;* from Africa, *E. Savignyi;* from Egypt, *O. Nigra;* and *E. Mauritanica* from Algeria. From America is *O. Cubana*, from Cuba; *O. Hubbardi*, from Florida; *O. Salvini*, from Mexico. From South America, *O. Braziliensis* and *O. Rufica-pilla*, the locality not known; *O. Batesii* from the Amazon; *O. Muelleri*, from Santa Catarina, South Brazil.

*Only two incomplete sets of the transactions are in Boston and Cambridge.

There are thus known from Europe one, perhaps two, species ; from Africa three, and from the islands near to it one more ; from Asia three, perhaps four ; from North and Central America, three : from South America, four species ; from the Sandwich Islands, one ; none from Australia. Probably only a small part of the living Embitina is known, and these only in very few specimens, which still form, as they did half a century ago, the gems of the collections. As far as I know, four species are represented by single specimens only, three by two specimens, one by three specimens, two by four, seven by more specimens, but none in a number sufficient to understand the whole history of the insect.

Systematic position and relation.

Prof. Westwood, with his usual sagacity, recognized directly that the three species known to him represented three different forms. So he accepted one large genus, with three sub-genera, which were considered to be genera by Prof. Burmeister, but united again in one large genus by Rambur. McLachlan accepted only two genera, Embia combined with Olyntha and Oligotoma.

The species belonging to Oligotoma are decidedly a very homogeneous group. The only aberrant species, *O. Westwoodi*, differs by a plainer and apparently aborted venation of the wings. Their principal characters are, the more slender form of the body, the small and longer ovoid or obcordate head ; the antennæ as long as head and thorax, or mostly shorter, with fewer (14 to 20) joints ; the narrow prothorax ; the comparatively long legs ; the narrow abdomen, with shorter appendages, and between them protruding the male genitals ; the narrow wings, not longer than the abdomen, with a plain venation, and only one lower branch of the submediana. Asymmetry known only in the male sex. Oligotoma is known from the warm regions of the whole world, and represented in copal and amber. The species belonging to Olyntha form also a homogeneous group. The body is larger and broader ; the head is broader, shorter, with antennæ as long as the body, with a third more (to 32) joints ; thorax larger ; the legs more slender ; the abdomen broad, with longer appendages (male genitals not well known) ; the wings are longer than the abdomen, much broader, the venation more complicated by two lower branches of the submediana. The coloration of the species is very uniform. No asymmetry is known. Olyntha is known only from South America and from Central America.

The winged species of Embia are intermediate among Oligotoma and Olyntha. The body is stronger and more flattened above than in Olyntha; the head is shorter, about quadrangular, but the antennæ are as short as in Oligotoma; the prothorax is shorter and broader than in both, but near to the head more narrowed; the thorax is still larger than in Olyntha; the legs are as long and as strong as in Oligotoma; the wings as long as the body (Oligotoma), but broader, with the venation similar to Olyntha; the abdomen is broader and more flat than Olyntha, but with the shorter appendages of Oligotoma. Asymmetry is known only in the female sex. Embia is known only from the old world in the countries around the Mediterranean and Persia.

The knowledge of the three groups is not sufficient to assert that all are only subgenera or genera; in the last case I believe that Olyntha and Embia can not be united.

There can be no doubt that the Embidina belong to a peculiar and well defined family, and cannot be combined with any other family, though a number of characters are found represented in other families.

The body is slender, elongate and flat above; the abdomen representing half the length of the body; the head is free, not inserted, small, flat, quadrangular or ovoid; the eyes are exactly in the front corner of the head, and in the imago state similar to aggregate eyes; ocelli, none; no dividing sutures of the head exist; antennæ as long as the body or half as long, praeocular, moniliform or partly filiform, slender and very fragile; mouth parts decidedly of Orthopterous character; maxillary palpi 5 jointed; labium bilobate, the inner lobes transformed into a spinning apparatus, as in Psocina, but with 3 jointed labial palpi, and without the peculiar maxilla of Psocus. Prothroax much narrower than the head, elongate, or as long as broad; always with a dorsal transverse furrow after the anterior third; thorax strong, oblong, the mesothorax longer; each segment of thorax with three dorsal parts, the last one of the metathorax (segment mediaire) like the abdominal segments. Abdomen flat, about equal, with nine transverse oblong dorsal segments and eight ventrals; at the tips on each side a bijointed appendage, short, or as long as the last segments; between them the male genital apparatus, just at the end of the abdomen; the female opening at the base of the seventh ventral segment; the appendages, the male genital apparatus and the last dorsal and ventral segment show, at least in certain forms, asymmetry. Wings not deciduous, narrow, rounded on tips, as long or a little longer

than the abdomen; all four of equal shape, length and venation. The legs are peculiar, the compressed and dilated shape of some parts seem to indicate burrowing legs; they are strong, long, reaching both ends of the body, the middle legs always less strong; the three pairs of legs are equidistant and attached to the ends of the respective segments; the legs of the first and of the middle pair are as distant from the legs of the opposite side as the size of the sternum will allow them to be; but the legs of the hind pair are approximate; coxæ small, stronger on hind legs; femur and tibia about the same length, compressed, inflated; tarsus about as long as tibia, but the basal joint of the first pair as long as tibia, inflated, curvate, with a superior furrow; second joint short; third joint longer, slender with two simple claws.

Systematic Position of the Family.

Savigny, Latreille, V. Audouin, Westwood, Burmeister, Rambur, have placed the Embidina near the Termitina. Westwood, l. c. p. 372, states: "Genus quoad affinitates, Termites cum Ensthenia Westw., inter Perlidas conjungens." I am sorry that he has not given a more detailed proof of this statement. By comparing *Olyntha Braziliensis* with *Eusthenia spectabilis* (both insects figured by himself on the same plate in Griffith pl 72), and by comparing a type specimen of *Eusthenia spectabilis*, kindly presented to me by himself, I confess to being at a loss regarding their affinity. McLachlan, l. c. p. 377, goes even further, not thinking the relationship between Termes and Embia so close as has generally been accepted, and that Westwood happily seized upon its position as between the Termitidae and Perlidae. He says that the external form is not always to be disregarded in searching for affinities, and that Embia has much of the external form of the Perlidae, especially of the genus Leuctra. But he has overlooked that certain species of Termes, for instance, *T. flavipes*, after having lost its wings is just as agile as Embia and very similar to its wingless forms. Some exotic species, as *Stolotermes*, imitate Embia, even in the winged form. Of course, each family belonging to the Pseudo-neuroptera has some characters in common with Embia, but after the knowledge of the internal female organs, which are exceptionally characteristic for the Perlina, we have to dismiss the opinion of a nearer relationship. Indeed, the slender and elongate form of the body excepted, which is found so common in many insects of

different orders, no character is left to bring the Embia nearer to Perla than to Termes. Burmeister, l. c., p. 768, is undoubtedly right in bringing them in a family of its own Embidae, near the Termitina (with whom they had been combined), because they differ from them by all parts of their body.

After a detailed study of the species before me (their number is much larger than the number in the hands of former students), and after due consideration, I believe there is no doubt that Embia is nearer to Termes than to any other family. Concerning the wings, I have given my opinion before in a very detailed manner, that they are not only homologous to the wings of Termes. the basal squama not being developed or aborted, but that the wings by their identical size, shape and venation cannot be compared with those of any other family. The abdomen, except being mostly more ovoid in Termes, is for the segment médiaire and the number of segments homologous; the mouth parts are alike, except the 5-jointed max. palpi; the antennae are similar; the legs are very different, the tarsus 3-jointed. The eyes are in the front corner of the head, while in Termes they are in the hind corner.

The relationship with the Psocina is indicated by the presence of a spinning organ opening on the labium, and by the similar distance of the coxae in some genera. *Embidopsocus* resembles Embia more than Termes, but is in fact a true Psocus, with the habitus of an Embia and with Termit wings. In another paper I may give more about this curious insect.

A comparison with the Odonata and Ephemerina seems not to be needed. Both show an important character of the Embidae, the situation of the eyes in the front corner of the head; the arculus of the Odonata is imitated in the wings of the Embidina.

The statement by Wood-Mason that Embia belongs to the true Orthoptera as a very degraded form—a statement which will probably be proved by him in a later paper—induced me to consider the aberrant forms of this group. The external forms of the curious genus Cylindrodes, have indeed some analogy with the apterous female of *O. Michaeli.* We know very little about Cylindrodes. *C. Campbelli*, from Melville's Island, Australia, was figured in Griffith's Animal Kingd., vol. xv., pl. 131, with details of the mouth parts and legs, and described by R. Gray, Mag. N. H., 1837, vol. i., p. 142, from one imperfect specimen, as belonging near *Gryllotalpa*. Burmeister makes of it a group of *Gryllotalpa*, and Serville a genus following *Gryllotalpa*. Saussure, Mel. Orthopt., 1877.

vol. v., p. 205, brings it in a separate Legion, Cylindrodites, with the only genus, Cylindrodes, and describes and figures, pl. 11, a new species, *C. Kochii*, from Australia, from a rudimentary specimen. None of the authors except Gray have seen this rare insect. Probably it is a female imago; it bores in the stems of plants, committing ravages in greenhouses; it is called by the colonists, wire-worm. The tibia of the anterior legs forms a hand similar to *Gryllotalpa*. What is known about this insect is mainly the general form, which is so different from Embidina that it is barely possible that this degraded family may among the Orthoptera be placed not far from the Embidina.

To try ancestral speculations upon our present insufficient, and for the Embidina, *very scanty knowledge*, would certainly by Darwin himself have been considered illegitimate, if not something worse!

TRAPPING COLEOPTERA.

BY F. B. CAULFIELD, MONTREAL, P. Q.

Wishing to procure a good series of Silphidæ for my collection, about the middle of August I put some scraps of cooked meat into an empty tomato can and hid it under a shrub. I visited it after a few days but found it untouched. I then baited a can with uncooked meat and placed it in a similar situation. I examined it on the 12th of August and took from it the following species:—

Necrophorus orbicollis, 10 specimens.
" *tomentosa (velutina)*, 6 specimens.
Silpha peltata, 20 specimens.
" *marginalis*, 12 specimens. (Of this and the preceding species I could have taken many more).
Silpha inæqualis, 4 specimens.
" *lapponica*, 1 specimen.
" *surinamensis*, 1 specimen.
Staphylinus villosus 1 "

I also took two specimens of a Staphylinus and a number of Histers not yet determined.

On examining the can containing the cooked meat, I was surprised to find in it seven specimens of *Centhophilus maculatus*, as I had not expected to trap Orthoptera.

I visited the traps again on August 15th, but as there had been a heavy thunder storm on the previous day, I met with poor success. The trap which had yielded so abundantly on the 12th, now contained nothing but water, but from the can with cooked bait I took 5 *orbicollis*, 4 *velutina*, 1 *surinamensis*, and 1 *Staphylinus villosus*.

NOTES ON CHRYSOMELA SCALARIS, Lec.

BY F. B. CAULFIELD, MONTREAL, P. Q.

In No. 7 of Entomologica Americana, Mr. G. W. J. Angell gives some interesting notes on this insect. Having examined a large number from various localities "showing a nearly complete gradual gradation from the finely maculate form of *philadelphica*, to the strongly marked *scalaris* type," Mr. Angell is of opinion that *philadelphica* Lin., *multipuncta* Say and its supposed varieties, are all varieties of *scalaris* Lec. I incline myself to the belief that *scalaris* and *philadelphica* are distinct species, and as my experience of these forms appears to be different to that of some other col lectors, I give it in the hope that it may lead to a careful study of their life habits. I find that Dr. Harris' history and figure of *scalaris* fit it exactly as it occurs in the neighborhood of Montreal. For years past I have found it on elm and linden, and on no other plant or tree. *Philadelphica* and *Bigsbyana* I find on willow and alder; never on elm and linden. Dr. Packard in his Guide states that *scalaris* is abundant on the alder. This statement puzzled me, as I never yet have found a typical *scalaris* on that shrub. In the Report of the Entomological Society of Ontario for 1882, Mr. W. H. Harrington states that *scalaris* is "found throughout the season on various trees, as elm, the linden, and especially the willows and alders. The same writer states that *philadelphica* feeds on the leaves of the pine. It would thus seem as if these insects varied their food plants in different localities. It is now too late to do anything this season towards settling the question, but next year I trust it will be fully investigated; meanwhile I would like to hear the opinions of other collectors.

HYBERNATION OF FORMICA HERCULEANA, Linn.

BY G. J. BOWLES, MONTREAL, P. Q.

On the 20th October last, when in Brighton, Ont., I went to the woods in search of hybernating insects, and while examining the prostrate trunk of a small pine, found several female specimens of our large black ant, *F. herculeana (ligniperda* Latr.) in their winter quarters. Each ant was in an oval excavation in the wood, just under the bark, about an inch long and half an inch wide and deep. In each cell was found a single ♀ ant, together with from six to fifteen larvæ. On tearing off the bark, about half a dozen cells were exposed, on different and widely separated parts of the trunk. In one or two instances there was a single worker ant with the large ♀. The larvæ were about an eighth of an inch long, and were all alive. They were, in every case, crowded together in a mass, each one in the same position, with the head bent over in front. This observation is, I think, interesting, as it gives a clue to the manner in which colonies of this wood-destroying ant are established. It is probable that the mother ant and the larvæ would survive the winter, and be ready in spring, as soon as the larvæ had become perfect insects, to begin operations from the cell in which they had hybernated. The cells were very neatly excavated, and each seemed to have been entirely the work of the ♀ ant which occupied it, as there was no connection with any other cell, and the surface of the trunk around each was perfectly smooth and uninjured. Nor were there any galleries extending from the cells into the wood of the tree, as I proved by close examination.

NOTES ON ACMAEODERA PULCHELLA, Hbst.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

The common species of *Acmaeodera*, *A. pulchella* Hbst., which is marked with shining bronze-black and bright yellow, assimilates well in color with the flowers of *Rudbeckia hirta* L., so abundant along the edges of cultivated fields, upon which this Buprestid is found. The dark parts of the beetle, which are after an etched pattern, blend well with the rich dark stigmata of the flower, as the beetle lies next to these; while the bright yellow parts easily pass unnoticed in the inside border of the yellow corolla. It is noticeable that these flower-frequenting species are found

chiefly on the flowers whose colors suit them best for protection ; in fact the insects seem to have been modified in color to suit the flowers they live on. This species is seldom found upon any other flowers than those of *Rudbeckia hirta* L. I have once taken it upon the flowers of tansy, once upon a partially yellowed leaf of *Œnothera*, once upon a high dandelion flower, twice upon the orange-red flowers of *Asclepias tuberosa* L., and once flying about some of the many flower-bunches of a clump of sumachs. These are the only exceptions that I have noticed, and are but isolated instances.

The perfect beetles are very abundant here in July ; in my notes I find reference to them only from 3rd to 13th July. It is in the heat of the day that they are to be found upon the upper side of the flowers, probably feeding upon the pollen ; toward evening, and in cloudy weather, as well as sometimes in sunny weather, they are to be found on the under side of the flowers, clinging to the sepals or petals, where they doubtless spend the night. Thus these flowers furnish the perfect beetles with food and home ; and probably their larvæ bore the very stalks which support the flowers. The beetles seem to avoid generally the large patches, frequenting isolated clumps with only a few flowers, or single flowers. On one isolated flower I have taken five or more, mostly large specimens, while the same day (8th July, 1883) I went through large patches of the flowers without taking one, or only a few scattered ones.

CORRESPONDENCE.

ON WILLOW AS FOOD-PLANT OF PAPILIO TURNUS.

Dear Sir : As stated on page 140, willow is given in "Butterflies," p. 309. I asked Mr. Scudder for his authority, and he replies, "Gosse, in Canadian Naturalist." On page 293 of this book, London, 1840, I read : "I have taken it" (the caterpillar) "from willow, poplar," &c. So far as I know, in the 45 years since that line was printed, willow has not been noticed as one of the food-plants of *Turnus*. I asked Mr. John Akhurst, who has bred *Turnus* as often as any one living, if he had ever found the larva on willow. He says he never has, and enumerates a great number of other trees on which he has found it. I should like much to know if any of the readers of this magazine have ever found this larva on willow, or of their own knowledge can say that this is one of its food-plants. W. H. Edwards, Coalburgh, W. Va.

The Canadian Entomologist.

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ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the Entomological Society was held in London at the Society's rooms, Victoria Hall, on Tuesday, October 13, 1885, at 8 o'clock p. m.

The President, Mr. Wm. Saunders, of London, Ont., in the chair.

Present—Mr. James Fletcher, Ottawa; Mr. T. Alston Moffat, Hamilton; Rev. C. J. S. Bethune, Port Hope; Mr. W. H. Harrington, Ottawa; Capt. Gamble Geddes, Toronto; Rev. F. W. Fyles, South Quebec; Mr. J. G. Bowles, Montreal; Mr. J. M. Denton, Mr. H. P. Bock, Mr. Lawrence Reed, of London; Messrs. Weld and Macdonald, of the *Farmer's Advocate*, London, and the Secretary-Treasurer, Mr. E. Baynes Reed.

The minutes of the former meeting were read and confirmed.

The President gave a cordial welcome to the visiting members and expressed the pleasure of the London members at meeting so many of their friends.

The Report of the Council, the Financial Report of the Secretary-Treasurer, and the Report of the Librarian for the past year, were then submitted to the meeting, and on motion duly received, discussed and adopted.

These Reports will appear as usual in the Annual Report.

The President stated that owing to unforseen circumstances no delegate had been sent to the last meeting of the American Association for the Advancement of Science held at Ann Arbor, Michigan, but that a summary of the business transacted by the Entomological Club had been kindly forwarded by the Secretary, and would be published in the CANADIAN ENTOMOLOGIST.

The Report of the Montreal Branch was read, and after an expression of gratification by members present at the prosperous condition of the Branch, the Report was received and ordered to be printed as usual.

REPORT OF DELEGATE TO ROYAL SOCIETY OF CANADA.

Mr. W. H. Harrington presented his Report read at the meeting of the Royal Society, as follows :

As delegate from the Entomological Society of Ontario, it affords me much pleasure to announce that the Society has continued to make satisfactory progress, both in membership and in the work which it undertakes.

The monthly publication of the "Entomologist" brings before students of insects, both in this country and abroad, very valuable and interesting papers on the habits and life-histories of our species, with frequent descriptions of new species discovered in our extensive country. Volume xvi. has been completed, and several valuable parts of xvii. have been already issued.

The "Annual Report," No. xiv., issued by the Society, contains several instructive papers prepared especially for agriculturists, and well supplied with such illustrations as may enable them to recognize the insects therein described.

The Montreal Branch of the Society is in a flourishing condition, which is due to the exertions of the energetic and enthusiastic Entomologists who reside in that city.

Gratification is felt at the evidence of a growing interest in regard to the very important question of the serious losses annually caused throughout the country by the depredations of various insects.

The Select Committee appointed by Parliament in 1884 to obtain information as to the agricultural interests of the Dominion, issued circulars to a large number of leading fruit-growers and other agriculturists throughout the country, requesting, among other points, an expression of opinion as to the desirability of the appointment of a Government Entomologist. A large majority of the answers were in favor of such an appointment.

Two members of the Council of the Entomological Society were also called, and gave evidence before the Committee as to the ravages of insects in Canada, and as to the advantages which would result from the appointment of a competent Entomologist.

The Department of Agriculture, impressed by the importance of the subject as thus brought before its notice,has since appointed as Entomologist one of the most energetic officers and workers of our Society—Mr. James Fletcher—who has issued a Preliminary Report, briefly describing

the most noticeable injuries caused by insects last season to the various crops.

In the United States great attention is still paid to the study of Economic Entomology. Several of the States, as well as the Federal Government,make liberal provisions for the investigations of appointed Entomologists.

The published Reports of such investigations are exceedingly valuable ; and furnish, with the exception of that supplied by the Entomological Society of Ontario, almost the only reliable information regarding the injurious insects infesting our orchards, fields and gardens.

It is a matter of no little importance that as full information as can be obtained should be, as widely as possible, circulated among our farmers, and to this end the appointment of an Entomologist by the Department of Agriculture is an important step in the right direction.

The President then delivered his annual address.

ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

Gentlemen,—The season of 1885 has not been distinguished by any unusual invasion by injurious insect hosts. Nothing assuming the proportion of a general or serious calamity in this direction has occurred in any department of agriculture or horticulture ; nevertheless instances have not been wanting where local injuries caused by insects have assumed considerable proportions, the sum total of which, if the results were expressed in money loss, would represent a very large sum.

The great staple productions of our country, such as wheat, oats, barley and hay, have not, so far as we have been able to learn, suffered material injury from insects in any locality in our Province, but while the farmers of Ontario have thus been exempt, our neighbors across the lines have not enjoyed the same immunity. In the neighbouring State of New York the loss occasioned by the Hessian Fly has been estimated at over $100,000. In the great wheat fields on the Pacific slope, and also in those of Dacotah and other Western States, there have been much severer losses from the same cause. Early in August I received from a correspondent in Dallas, Oregon, samples of wheat seriously injured by another destructive insect which as yet, happily, has not to our knowledge occurred in Canada. This is a small yellowish worm from one-sixth to one-fifth of an inch in length, which is found within the stalk of wheat about

or between the joints ; sometimes there are four or five larvæ in a single stalk, one above each joint for the first four or five joints from the ground, which cause the stalk to prematurely ripen or to wither, and thus occasion great loss. This insect, which is known as the "Wheat Isosoma," *Isosoma tritici*, Riley, has been observed for two or three years past, injuring the wheat in Illinois, Tennessee and Missouri, and has prevailed in some localities to such an extent as to ruin the crop. From the observations thus far made it seems that there is only one brood of this insect during the season, and that it passes the winter in the straw either in the larval or pupal state, the perfect flies appearing the following spring. Under these conditions the remedy is obvious, viz., burn both the stubble and the straw after harvest ; rotation of crops has also been found beneficial.

The cabbage crop has been materially injured by the ravages of the cabbage Anthomyia, *Anthomyia brassicæ*, a two-winged fly which in the larval state burrows in the stem of the young plant and causes its death. This cabbage insect is a native of Europe, is very troublesome in Britain and has been known as a destructive insect in this country for about thirty years, but nothing is known either of the date or the method of its introduction. The flies appear in the spring and deposit their eggs upon the stems of the young cabbages, about or a little below the surface of the ground. The eggs hatch in about ten days, when the young larvæ usually bore into the interior and work their way down towards the root; sometimes they merely gnaw grooves on the outer surface of the stem, and by this means find their way to the roots on which they feed. When full grown they change to yellowish red chrysalids in the earth, from which the flies shortly escape, the whole period of their life history thus briefly traced occupying about eight weeks. Usually the plants attacked soon wilt and finally die. It is believed that there are two or three broods of these insects during the year.

Several remedies have been recommended, such as dipping the roots and stems of the young plants in strong lye, or a mixture of earth and cowdung diluted with water, or a thick mixture of soot and water. Any bitter or alkaline substance which would adhere well to the outer surface would probably deter the flies from depositing their eggs. Lime added to the soil in the proportion of 100 to 150 bushels to the acre, after ploughing, and well harrowed in so as to keep it near the surface, has proved a very effectual preventive measure, or even where the insects are

at work on the plants, if the earth is scraped away from about the stem of each and a handful of lime dusted around it and the soil again drawn up to the stem, the plants will sometimes recover. Coal-dust, gas-lime and stimulating artificial manures have also been recommended.

The cabbage has also suffered from injuries caused by the common cabbage worm, the green caterpillar of the cabbage butterfly which feeds upon the foliage, and often disfigures it to such an extent as to render it unmarketable. The habit of this caterpillar, feeding as it does among the folds of the leaves, makes it extremely difficult to reach with any sort of poison without at the same time rendering the cabbage unfit for use. Pyrethrum or insect powder, which is the powdered flowers of *Pyrethrum cinnerariaefolium*, has been used with good effect, either dusted on the plants, or mixed with water and applied to them with a syringe, and this remedy is not in any way objectionable or poisonous. The Pyrethrum plant is in my experience quite hardy in Ontario, has stood the severe cold of the past two winters without injury, and flowered freely. It is easily raised from seed, and being a perennial species, when once established it will continue to flower for an indefinite number of years. The flowers, collected when just about to expand, dried and powdered, are very efficient as a general insecticide.

During the past year or two many interesting experiments have been made and valuable results obtained, in the way of artificially introducing disease among communities of caterpillars, a sort of caterpillar plague or pestilence which carries them off by thousands. There is a very fatal disease which appears from time to time among silk worms, the larvæ of *Bombyx mori* when bred for the production of silk, a disease which spreads so rapidly that it frequently destroys entire broods of caterpillars within a few days. So destructive has it been that it is estimated that the silk crop in Europe is damaged by it to the extent of many millions of dollars annually. During the past ten years it is believed to have reduced the income of silk breeders some twenty-five per cent., and in 1879 was said to be the main cause in the great falling off in the silk crop of that year, which was only about one-fourth of the amount ordinarily produced. The celebrated Pasteur investigated this disease, and found it to proceed from the presence of an exceedingly minute form of bacteria, so excessively small that it has been estimated that it would require eight millions of them to cover the head of an ordinary pin. When water containing these minute organisms is sprinkled on the leaves on which the silk worms are

fed, they are found to be rapidly infected and capable of communicating this pestilential disease to others with which they are associated. The bacteria may be preserved in a torpid condition without loss of effectiveness for at least a year, probably for several years, and that without any particular care, and when required for use can be rapidly propagated in a suitable fluid.

In my address to you last year I referred to a similar form of disease which had occurred among cut-worms so abundant in clover fields in the Ottawa district, and in 1878 and 1879 to a similar trouble among the forest tent caterpillars at that time so abundant. Now I am glad to be able to report a similar disease among the cabbage worms,and to indicate to you some practical results arising from investigations regarding its nature and mode of operation.

Throughout most of the State of Illinois and in some parts of Michigan, it was observed last autumn that a large proportion of the cabbage worms sickened and died. Hundreds of their bodies were to be seen rotting on the cabbage leaves or shrunken and dried to a blackened fragment. This was soon brought under the notice of the State Entomologist of Illinois, Prof. S. A. Forbes, a most careful and indefatigable observer, who at once proceeded to investigate the cause of this caterpillar plague. He found the disease at first to be very unevenly distributed, some isolated fields showing no trace of it, while others not far distant were fairly reeking with death and decay, but as the season advanced it spread in every direction until in some districts almost every worm perished. He says, "We can conceive something of the significance of this disease if we imagine the terror and dread which would seize mankind if such a plague should sud denly assail human life. Whole towns would be depopulated and the dead would rot in the streets by hundreds. There would be no escape for any, because the contagion would be conveyed by the very food and drink by which life was sustained."

By dissecting specimens of the dead caterpillars, the microscope showed their intestines to be full of undigested food and swarming with a species of micrococcus, which appeared in the form of excessively minute spheres about one twenty-five thousandth of an inch in diameter, sometimes single, sometimes in pairs, and occasionally in strings of from four to eight. He found that these minute organisms could be readily cultivated in beef broth, and that a single drop of fluid from a diseased worm introduced into a vessel of such broth, would in two or three days render the

whole contents milky with myriads upon myriads of these microscopic organisms precisely the same as those taken from the diseased larvæ. He also found by experiment that the disease could be communicated to other species of caterpillars. Experiments continued during the present year have shown that by propagating this form of bacteria in the manner described, and mixing a pint of a well-charged culture with a barrel of water and syringing cabbages with this fluid, the disease may be introduced,thus furnishing us with another means of defence against some of these injurious insects.

A new strawberry insect has appeared in our midst which is deserving of notice. In the latter part of June last public attention was called to this subject by some paragraphs which appeared in the newspapers. The depredations of the insect were first observed in Staten Island, New York, causing grave apprehensions among the strawberry growers there; it appeared also about the same time in some parts of Michigan. The Entomological Bureau of the Department of Agriculture in Washington promptly took steps to investigate the subject, and the Chief of the Bureau, Prof. C. V. Riley, proceeded in person to enquire into the character and extent of the injury,with the view of suggesting measures for its abatement. The results of this work have not yet reached us, beyond some brief notices which appeared in the press, in which the nature of the injury was stated and the name of the insect given. This new pest was found to be a small curculio which has been known to Entomologists in this country for more than fifty years under the name of *Authonomus musculus*. It is a small snout beetle which measures, including the beak or snout, only one-tenth of an inch. The body is of a dull reddish colour, punctured, and dotted and spotted with white; different specimens vary much in their general hue, some being found very dark, occasionally almost black. Heretofore it has been met with only in the collections of Entomologists, who have found it to be very generally destributed throughout the Middle, Southern and Western States, and also in Canada, but nowhere in any particular abundance, and no one had thus far suspected it to be guilty of any injurious propensities; indeed, little or nothing has been known of its habits or history. A few days after its appearance in this new role—as a strawberry pest—was announced in the United States, I received a package from Mr. J. C. Morgan, an energetic strawberry grower in Barrie, Ontario, intimating that a destructive insect which had never been noticed before was seriously injuring some of the strawberry beds in that neighbourhood, an

insect which seemed to have a special liking for that variety of strawberry known as the Sharpless. When speaking of this pest Mr. Morgan says: "It climbs up the flower stalk, selects one flower, and deliberately and quickly cuts it off; as soon as the flower falls or hangs over by a small thread, the insect crawls down, runs up the next stalk and commences again. This performance is varied by puncturing the open blossom in several places, which said blossom will also come to grief. It is found in immense numbers on the Sharpless, slightly on the Wilson, and on no other berry as yet." On examination this was determined to be the same species as that which had occurred on Staten Island and in Michigan. It is remarkable that this insect never met with before in any great number, should have occurred in such abundance at points so distant from each other as Staten Island, N. Y., Michigan, and Barrie, Ontario, all about the same time, and not be reported as occurring at intermediate points. In the absence of further knowledge of the life history of this insect, we can only suggest as a remedy the use of Paris green and water in the proportion of a teaspoonful of the poison to two gallons of water, which if applied to the vines with a syringe when the beetles are troublesome, would probably destroy many of them.

Further complaints reached us during the early summer months of injury done to the blossoms of the grape by the Rose Beetle, *Macrodactylus subspinosus*. I can only repeat what has been already several times stated, that this pest may be much lessened, if not entirely got rid of, by jarring the vines early in the morning while the beetles are in a semi-torpid state and collecting them on sheets and destroying them.

The pea crop has for the past year or two been unusually free from the Pea-bug, *Bruchus pisi*. Now that the life history of this insect is so well known, farmers are more careful in selecting the seed, while seed dealers by special treatment are enabled to destroy the insects in the peas before offering them for sale. The gratifying immunity from this pest and the large saving thereby effected, is doubtless to be attributed mainly to greater care in these particulars.

In the address presented to you in 1880, I offered some remarks on the relations existing between birds and insects, and expressed the opinion that while the soft-billed insectivorous birds are exceedingly useful, that birds in general are not of such great use in subduing injurious insects as is commonly supposed, and that destructive insects are controlled to a far greater extent by their insect enemies and by the diseases to which

they are subject. Experience since gained has confirmed this opinion. During the period which has elapsed much discussion has taken place regarding the English sparrow, which has now increased to a considerable extent in many of our towns and cities, and occasional flocks of them find their way into the country. While this fearless little bird has had many advocates, the weight of evidence is undoubtedly against it, and it now stands convicted on several counts: of destructive propensities from the grain it destroys and devours and the injury it does to fruit trees by eating the buds; of pugnacity, which results in its driving away other and more useful native birds, while on the other hand the good it does in the way of consuming injurious insects, as proven by the examination of the crops of many of them, is comparatively small. The question is often asked by the friends of the sparrow, when the merits of this little emigrant are under consideration: "How is it that we hear no complaints of its depredations in England, where it has so long been a common bird?" Frequent complaints are made in England regarding it, and measures urged for its destruction. In recent reports issued there, especially those published by that well known and talented authoress, Miss E. Ormerod, we find serious charges recorded. One writer states that the sparrow has greatly increased in England during the past ten years, that large flocks of them sweep down on the wheat fields, devouring and destroying a considerable proportion of the grain. It is estimated that one million pounds sterling would not repay the farmers of England for the yearly loss sustained through the depredations of this quarrelsome pest. Besides the direct injury thus occasioned, it is said that sparrows prevent the increase of swallows, and drive the soft-billed insect-eating birds, which feed largely on the eggs and larvæ of insects, from the gardens and orchards, while they seldom eat a caterpillar. Another bears evidence of having seen a field of wheat so utterly ruined by legions of sparrows that it was left uncut; many other similar instances are cited. It is highly probable that we shall in the near future have many occasions to regret that this bird was ever introduced into Canada.

During the past year some interesting facts have been published bearing on the retarding influences of cold on the development of insects, as seen in the arctic regions. These observations have extended over several years, and show that butterflies which in the warmer regions of the earth pass through all their transformations once or more in a season, take two or three years to complete a single cycle where the summer season is very short and the prevailing temperature low.

Besides the report of our own Society, which contained much useful and practical information, there has been issued in Canada since I last addressed you a preliminary report by the Dominion Entomologist, Mr. Jas. Fletcher, containing some useful records of work done during the year and plans for more extended usefulness in the future. It is cause for sincere regret that our esteemed fellow-laborer has in consequence of a severe affliction been obliged to postpone the completion of some of his cherished plans, and thus the completion of work begun with much vigor and promise has been unavoidably delayed. We sincerely hope that he may soon be entirely restored, and thus be enabled to carry on with increased efficiency the work he has undertaken. In addition to the excellent annual report of Miss Ormerod, which has already been noticed, there has been issued in England a useful pamphlet on "Insects Injurious to Hop Plants," prepared for the Agricultural Department of Great Britain by Chas. Whitehead. This issue is to be followed by others on grain, root and fruit crops, and it is sincerely hoped that the issue of these publications will awaken in the minds of the agriculturists of Great Britain a livelier interest in the importance of the study of economic entomology. In the United States much has been done. The Entomological Bureau in Washington, under the able direction of Prof. Riley, has most efficiently continued its good work by investigating insect pests in all parts of the United States, and in endeavoring to devise useful measures for their destruction. The reports issued during the past year have been most valuable, and are profusely illustrated. The annual report of Prof. Forbes, State Entomologist of Illinois, is also especially worthy of notice. Very excellent papers on economic entomology have also been published by Prof. J. A. Lintner, State Entomologist of New York, Prof. A. J. Cook, of Lansing, Michigan, Prof. Herbert Osborn, of Ames, Iowa, and others.

Mr. Wm. H. Edwards, of Coalburgh, W. Va., has published a revised catalogue of the Diurnal Lepidoptera North of Mexico, and has continued the publication in parts of his magnificent work on the Butterflies of North America. He has also continued his observations on the life histories of American butterflies, the results of which have been published in the monthly organ of our Society, the CANADIAN ENTOMOLOGIST. A new list of Coleoptera of America North of Mexico, by Samuel Henshaw, has also appeared.

Some indication is given of the progress being made in the study of Entomology in any community, by the extent of information recorded in

reference to the Diurnal Lepidoptera found in such district. If such an indication may be taken as reliable, we in Canada have made much progress within the past few years. Twenty years ago when our Society published its first list of Canadian butterflies, the number of species then known was 66; now our lists contain no less than 210. For a large proportion of this great increase we are indebted to the labors of Mr. G. Geddes in the Rocky Mountains and North-west Territories, and to those of Mr. James Fletcher in British Columbia. These gentlemen have been indefatigable in their work, and at the same time most successful. While there may not now be many more laurels to gain among the Diurnal Lepidoptera, there are other inviting departments of labor in which any industrious Entomologist may add much to our present knowledge. We are glad to know that Mr. W. H. Harrington is making good progress in the collection and study of our Hymenoptera; we hope that some of our members will be induced to undertake in a similar way our Diptera, Neuroptera, Hemiptera and Orthoptera, so that we may soon be able to form some idea of the richness of our territory in these long neglected orders. WM. SAUNDERS.

ELECTION OF OFFICERS.

The following named gentlemen were then duly elected as officers of the Society for the ensuing year: President, William Saunders, London, Ont.; Vice-President, Rev. C. J. S. Bethune, M. A., Port Hope, Ont.; Sec.-Treas. and Librarian, E. Baynes Reed, London, Ont.; Council—J. Fletcher, Ottawa; Rev. T. W. Fyles, Quebec; J. A. Moffat, Hamilton; W. H. Harrington, Ottawa, and G. J. Bowles, Montreal. Editor CANADIAN ENTOMOLOGIST, Wm. Saunders; Editing Committee—Rev. C. J. S. Bethune, J. M. Denton, Jas. Fletcher, and E. Baynes Reed. Auditors—W. E. Saunders, H. P. Bock; Delegate to Royal Society—W. H. Harrington.

LARVÆ OF HEMILEUCA MAIA, DRU.

BY CHAS. F. GOODHUE, WEBSTER, N. H.

It was my good fortune, in May last, to find a brood of the larvæ of this species. As they were very different from the only description we have seen, i. e., that of Morris in his Synopsis, we herewith give a description of three of its stages. As all the stages were not observed we will begin with the last, as it will by that means be more short. Mature larvæ, 1.50

to 1.75 inches long, color black, thickly dotted with yellowish white. Head slightly triangular, smooth and shining. Head, top of segment next to it, feet and vent, rich reddish brown.

On segments 2, 3, 4, 5, 6 and 11 are eight rather long branching black spines. Segments 7, 8, 9 and 10 have six, and segments 12 and 13, seven. The two dorsal spines on segments 3 to 11 and one on 12 are surrounded at the base with a spreading tuft of yellowish bristles. Preceding stage like the last, only there are no yellowish dots on the body. The next before this, and the first stage observed, the larvæ are entirely black; no yellowish bristles round base of dorsal spines as in the two last stages.

The larvæ were somewhat different in color for a few hours directly after the last moult, from what they were afterwards, being lighter in color, but they were all alike, and like the description given in twelve hours after moult.

July 9 they went under a few loose leaves on the bottom of the feeding box and made a cell in the debris without spinning any silk.

Four days after some of them had changed to pupæ, and in seven or eight all had changed.

The pupæ are .75 to .85 inch long, dark brown, head case smooth and rounded; the joints of the abdomen are close, making the pupæ rather rigid. The pupæ closely resemble those of *Hyperchiria Io*, but smaller and a trifle more slender.

The moths came out the middle of Sept.

The larvæ were found on common meadow sweet *(Spiræa salicifolia)* and were reared on it. We have always thought that the food plant would prove to be something besides oak, from the habits of the moth, it being almost invariably found on low, wet meadow land, oftentimes at a long distance from oaks of any kind. Willow is also given as one of its food plants.

The larvæ are gregarious, many feeding on a single twig, and when at rest are closely packed together, much resembling the larvæ of *Vanessa antiopa* in this respect, as they also do in looks.

The moth is usually common in this locality during the last of Sept., when it may be found on the wing in the middle of the day, coursing back and forth over the low lands.

The males are usually in excess of the females, thirty to one, and it is uncommon to get a perfect female, they nearly always being torn and ragged.

DESCRIPTION OF THE PREPARATORY STAGES OF PHOLISORA CATULLUS, Fabricius.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Conical, the base flat, the top truncated, rounded, and divided from centre outward into eight or nine rounded, nearly equal, smooth lobes; at the micropyle a deep depression; sides marked by about 15 vertical ribs, low, rounded; the spaces between the ribs a little excavated, and crossed horizontally by many fine striæ; color pale yellow-brown, or luteous. Duration of this stage about five days.

YOUNG LARVÆ.—At 12 hours from egg, length .04 inch; slender, the middle segments somewhat thickest; color green-orange, under side green-yellow, as are the feet and legs; segment 2 is whitish, with a black chitinous dorsal collar in front; head sub-globose, black-brown, shining. Duration of this stage three days.

After first moult:—Length, at 12 hours, .12 inch; shape as before; color yellow-green, thickly covered with minute yellow points, each of which gives out a short fine whitish hair; the collar on 2 black; head sub-cordate, roughened, black-brown, with a covering of fine down. Duration of this stage three days.

After second moult:—Length, at 12 hours, .16 inch; shape as before; color same; head as before. To next moult three days.

After third moult:—Length, at 24 hours, .42 inch; stout, of nearly even thickness from 4 to 12; color yellow-green, with tubercles and hairs as in previous stages; head as before. To next moult two or three days.

After fourth moult:—At 12 hours, length .6 inch. Three days later,

MATURE LARVA.—Length .7 inch, greatest breadth .16 inch; obese, a little thickest in middle segments, but very stout from 4 to 12; color yellow-green, thickly covered with fine flattened tuberculations, of irregular sizes, whitish, each giving out a fine short white hair, whereby the surface is downy; a faint sub-dorsal yellow stripe on either side; under side, feet and legs, more green; segment 2 has a narrow black chitinous dorsal collar, cleft at summit; rest of 2 whitish; head sub-cordate, rough, black-brown, covered with fine down as the body. From fourth moult to chrysalis seven days.

Some larvæ in last stage have no trace of the sub-dorsal stripes; and in some the color is brownish-green.

Chrysalis.—Length .52 inch, greatest breadth .14 inch; cylindrical.

slender, thickest in middle and tapering slightly to head; the head case compressed on dorsal side, so that there is an even slope from top of mesonotum to the end; this last is rounded, and at either end of the curve the ocellar prominence is set, also rounded, and not projecting so far as the top of the curve; all this part thickly beset with short bristles; the mesonotum round and scarcely elevated, color greenish-yellow, or greenish-brown, according to the color of the larva, covered with a whitish mealy dust; on either side of dorsum, at base of head case, is a small round black process, surmounted by a circle of short bristles. Duration of this stage when the imago comes forth the same season, about seven days. From laying of egg to imago about thirty days.

This pretty species flies quite generally throughout the United States to Pacific, and Mexico; also in the southern part of British America. Abbot says it is to be found about gardens and fields, and among melon blossoms. It is somewhat abundant in some years in my own garden, and I have observed it often about melon and cucumber patches, alighting on the leaves. Probably its fondness for gardens is because its larval food plant, pig-weed (Ambrosia) abounds in such places. I know of no other food plant, but Abbot gives horse-mint, Monarda punctata, Origanum, Chenopodium, which he calls lamb's quarters, and another plant called "careless," but which neither Wood nor Gray help to identify. The egg is laid singly on the upper side of a leaf, sometimes near the edge, but generally near to the mid-rib. It is of a peculiar shape, quite different from that of any species of Nisoniades which I have seen, and reminds one of a confectioner's cake-mould, or of an inverted basket made of fine willow twigs. The color, too, is peculiar, as compared with other Hesperian eggs, which are usually white or yellow-white when laid, being red-brown, and looking on the leaf like a speck of dust. I have often found several eggs on a stunted plant not more than two or three inches high growing on the gravel walk.

The young larva goes to edge of its leaf, cuts in about one tenth inch, and folds over a corner so separated, binding it down by two or three threads. Here it lies concealed till the first moult has passed, and feeds on the fleshy part of the leaf within the fold. After first moult the larva draws the leaf together by the edges, and from second moult on the hiding place is readily distinguished by the oval swelling of the leaf. When about to moult the case is thickly lined with silk, and closed at every point. The larvæ come outside to feed and return to their cases, and

feeding takes place at night. Some of my examples were kept in tin boxes, and on one occasion I surprised one of the larvæ feeding at a distance from its case; at another, one was close to the opening and hastily retreated into the case, tail foremost, as I opened the box. They are perfectly neat in their cases, the frass being always expelled or voided outside. At any time after the first stage and to maturity, on slitting a case, the larva will be found lying with anterior segments bent round so that the head comes a little beyond middle of body, and in nearly every instance I have found the tail towards the closed end of the case.

There seem to be two broods of the imago in West Virginia, flying in June and August. The larvæ found in September have hibernated, to pupate in the spring, but larvæ of summer produced butterflies the same season. The larva is full-grown when hibernation takes place, and after awaking, pupates almost immediately, that is, after 2 or 3 days. This habit is like that of species of Nisoniades observed. Abbot, Ins. Ga., says that a larva of *Catullus* which pupated 18th June gave butterfly the 26th; another which pupated 29th July gave butterfly 5th August; and one which "enclosed itself 14th Sept., gave butterfly middle of March." By this I conclude there are three broods of the imago in the Gulf States.

I have, as I write, 13th Sept., 1885, two larvæ in hibernation, one of them under a leaf on a bit of paper. The leaf is moulded to an oval, rather a half oval, cut lengthwise, the edges flattened all round, and everywhere bound to the paper by close web, so that quite an effort is required on my part to raise the edge in the least. The other caterpillar lies under a small, oblong slip of paper upon a larger piece which at one end is bent considerably. At that end the opening between the two is a half circle. This is closed by a sort of lace work, full of small openings, and the web first spun is strengthened by several stout threads which lie upon it and cross in various ways. This sort of drum-head covering would resist a strong attack of any enemy but a bird or mouse. The other three sides of the slip of paper are held down by stout threads or cords each of very many fibres, having their attachments upon bases of web thickly spread upon the under paper and at the edges of the upper one. How these threads are brought together at the middle into such a cord is not apparent, but they seem to be laid side by side and cemented In color these cords are black, while the web itself is pale brown. One cord holds the end of the slip, two hold one side, one of them near either end, and three hold the other side. In addition to this the three sides

have web woven all around within. This is the sort of foresight these larvae exercise in providing for hibernation.

Except the brief account of Abbot above referred to, I have found nothing relating to the history of *Catullus*. Mr. Scudder, in Butterflies, p. 9, fig. 14, gives a cut of the egg, which is not a good one, from an example distorted perhaps by alcohol. Instead of rounded lobes at top, this part is made up of illy-defined points, and the sides are not symmetrical. Abbot figures the mature larva pretty well, the head excepted, which is out of drawing, and discovers three whitish points on front face. In nature these spots have no existence. The chrysalis is better. So far as I am aware, this is all relating to *Catullus* hitherto published.

PREPARATORY STAGES OF ICHTHYURA ORNATA.

BY G. H. FRENCH, CARBONDALE, ILL.

Egg.—Diameter .035 of an inch, about the same in height; blunt, conical, the base flat; smooth; white, a dull red band round each a little below the middle, which is pretty well defined on its lower edge, but the upper is irregular, sometimes a small red speck on the apex. Duration of this period 10 days.

Young Larva.—Length .08 of an inch. General color grayish white, a purplish red band across each of the following joints, 2, 5, 7 and 12, with a faint row of the same along each side. Head jet black, broader than the body; joint 12 a little elevated; thoracic feet black, the others concolorous with the body; the body sparsely covered with white hairs half the length of the larva. Duration of this period from 2 to 3 days.

After the first moult.—Length, .15 of an inch; color much as before, the red on joints 5 and 7 broader, the latter a little faint, the lateral stripes more distinct, three faint stripes on the dorsum; all these stripes of the same color as in first stage. Duration of this period, 6 days.

After the second moult.—Length, .25 of an inch. Of the same general appearance as before, but some change in color. Head, jet black. Dorsum yellow, slightly green tinted, containing three fine reddish purple stripes; joints 5 and 12 slightly elevated and reddish purple, as also the anal extremity and a narrow shield on joint 2. On the sides above the stigmata a broad reddish purple band; below this the color is yellow, not so bright as on the dorsum, mottled with purple, the purple hardly in lines

except above the feet; thoracic feet black, the others light. Duration of this period, 4 days.

After the third moult.—Length, .35 of an inch. Of the same general character as during the preceding stage; the dorsum yellow, with three reddish purple lines, but the piliferous spots on all the joints but 5 and 12 are more prominent and brighter yellow; the lateral stripe purple as before, but on some examples it contains a darker central line, below this a row of yellow piliferous spots, the area below these yellowish and striped by about three broken lines. Joints 5 and 12 have each a transverse band of purple and a row of black piliferous spots, slightly elevated. Venter and anal part, translucent whitish; head, brown; hairs, white. Duration of this period, 7 days.

After the fourth moult.—Length, .65 of an inch, but few changes from the preceding period. Marked as before, but more robust; the broad lateral stripe pale and composed of mottlings of red, brownish tinged, on a whitish ground, the thin dorsal lines the same; piliferous spots yellow; head paler than in preceding period.

Mature Larva.—Length, when at rest, from .85 to .90 inch; nearly cylindrical, a little enlarged through joint 5; head, .12 inch in diameter; joint 5, .15 inch. In color an almost uniform mottled reddish brown and whitish, the latter in irregular annulations to the brown patches; a dorsal line, and one on each side of it, a little more distinct brown. In some examples the brown is slightly greenish tinted, and the white is more extensive, giving the body a slight gray tint. Piliferous spots, yellow; head, light brown, mottled so that the anterior parts of the cheeks are darker brown; legs concolorous with the body; stigmata black. Duration of this period, 5 days.

Chrysalis.—Length, .55 of an inch; depth of thorax, .16 inch; of abdominal joints 3 to 5, .20 inch, from which it tapers gradually back; cylindrical, slightly depressed on dorsum of joints 1 and 2; abdomen blunt, conical; wing, tongue and leg cases extending to a little back of the middle of joint 5; the anterior part of the abdominal joints slightly punctured; the rest of surface smooth except corrugations on the wing cases. Color, chestnut brown, the wing cases darker, eyes dark brown. Duration of this period from 8 to 10 days.

The eggs that furnished the larvæ for the preparatory stages given here were sent me from Truckee, Cal., by Mr. C. F. McGlashan, June 15, 1885, the eggs having been deposited June 9th. This gives us from 43 to

45 days from the egg to the imago, a period about the same here as *Palla*. I am inclined to think, however, that in its home in the Sierras its growth is not so rapid, probably requiring a longer time for development, and finally passing the winter in the chrysalis state instead of producing the imago as it did here. A part of this is conjecture, however, for though I learned from Mr. McGlashan's letters that his chrysalids had not hatched some time after mine had, I do not know but they may have done so since. With us the species would be double brooded the same as *Palla*, the last chrysalids hibernating.

Like *Palla*, the food plant is willow. As soon as hatched the larvæ begin to fasten leaves together with silk, forming a retreat or vivarium within which they live together. When at rest the anterior part of the body is bent to one side. This was noticed more after the second moult than before, but continued through the larval stage. During the early periods they ate the parenchyma of the leaves, leaving the framework. When ready to spin their cocoons some leaves were fastened together, and inside this was spun the cocoon that did not differ materially from other species.

BRITISH COLUMBIAN HYMENOPTERA.

BY GEO. W. TAYLOR, VICTORIA, B. C.

In the June number of the CANADIAN ENTOMOLOGIST, p. 114, there is a paper by M. L'Abbe Provancher, containing descriptions of a new genus, *Platysoma*, and 7 new species of Canadian Hymenoptera. Six of these new species, *Ich. Vancouveriensis*, *Platysoma tibialis*, *Limneria compacta*, *Mesoleptus fasciatus*, *Phylax pacificus* and *Phylax niger*, are from Vancouver Island, and I am under the impression, for reasons which I will now state, that the specimens of these species from which M. Provancher's descriptions were made were from my collection, though no mention of my name appears in M. Provancher's paper.

In February, 1883, in response to the request of Mr. W. Brodie, of Toronto, I sent to him specimens of all the Vancouver Hymenoptera I then possessed. In June, 1883, Mr. Brodie returned named 81 species, which I have enumerated in vol. xvi., p. 77, of the CAN. ENT., and a few more were returned to me in Feb., 1885, but he made no mention whatever of the fact that any of the species named were new.

A reference, however, to my list will show that all of M. Provancher's new Vancouver species are there included, and it appears most probable, therefore, that he had my specimens from Mr. Brodie and wrote his descriptions from them. He acknowledges in the paper referred to that the insects were sent him by Mr. Brodie.

From what I know of M. Provancher, I feel sure that if he had been informed by Mr. Brodie that the specimens were not his own, but mine, he would have mentioned in his paper the name of the collector as well as the locality in which they were to be found.

Now, while I care but little about my name appearing as the captor of new species, I hold that such action as Mr. Brodie's results in a positive injury to science. First, because had I known that I possessed a number of new species, I should most certainly have placed them where they would have received greater care and have been of greater use than in my cabinet, viz., in the collection of some public museum. Secondly, had I been communicated with, I would have submitted to the describer a series of each species, for I have a series of all but one, and in some cases I have both males and females, and everyone will admit that a description made from a series is of much greater value than one made from a not-over good single specimen.

Of course it is just possible that the insects described were collected by some one else. If this is so, the coincidence is an extraordinary one.

CORRESPONDENCE.

A RARE SPHINX ADDED TO THE CANADIAN LIST.

Dear Sir: I wish to record as an addition to the Canadian fauna, the exquisite little Sphinx moth, *Pterogon Clarkiæ* Boisd., a perfect male of which has been generously presented to me by my friend, the Rev. G. W. Taylor. This little gem is well figured at No. 5, Plate xiii., of Strecker's Lepidoptera. The specimen in question was taken at Victoria, Vancouver Island, about May 15, 1884, while hovering over the flowers of a lilac bush in company with *Hemaris rubens* H Edw. and *Papilios Rutulus* v. *Arizoniensis* W. H. E., and *Eurymedon*. The coloration of this species is very beautiful. The general hue of the primaries is olivaceous, but

more of a brown than a green tint. The secondaries are bright yellow with a broad black marginal band and white fringe. The expanse of the wings is 1⅜ inches. The markings of the primaries somewhat resemble those of *Darapsa myron* Cram., and consist of a small dark patch on the costa near the base, a dark median band and discal spot, and a subterminal dark line which widens to a large triangular mark at the apex. The marginal black band in my specimen is much wider than in the specimen figured by Mr. Strecker. J. Fletcher, Ottawa, Ont.

PERSONAL.

Dear Sir: In the last Report of the Agricultural Dept. of Washington, Mr. C. V. Riley speaks of the "general untrustworthiness" of my "work" as illustrated by my referring in my New Check List *Phycis juglandis* as a var. of *indiginella*, and using the term *Phycis* instead of *Acrobasis* (used formerly by me). As to the first, I did so because Le Baron thought *juglandis* might be a variety. I have usually been taken to task by Mr. Riley for considering varieties as species. In a Check List, I need not say, the author is not bound to know all about every species he includes. As to the latter, Haworth's name *Phycis* must be used for some genus of the *Phycidæ*. Dr. Walsh having used it for our species *indiginella*, led me to follow this example rather than for *Pempelia*. It should be remembered that these comments on the character of my work in this instance come from a person who in his descriptions of N. Am. *Phycidæ* failed to give a *single structural character* by which his species could be generically referred, as I have already shown. My classification of the *Pyralidæ* in the Check List has elicited the approval of Prof. Fernald, who is universally recognized as a high authority in this family. I am sorry that Mr. Riley should abuse Government Reports by inserting such personal and unwarranted remarks.

Aug. R. Grote, Bremen, Germany.

BUTTERFLIES OF NORTH AMERICA.

We are glad to be able to announce that it is the intention of Mr. W. H. Edwards, author of that superb and well known work on the Butterflies of North America, to proceed with the third volume without delay. It will be the author's endeavor to maintain in every respect the high character of this work, which as it involves a very large outlay, will we trust be widely appreciated and meet with that liberal patronage which it so well deserves.

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